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Transactions of the Woolhope Naturalists' Field Club

Woolhope Naturalists' Field Club, Hereford, England, Woolhope Naturalists' Field Club

S-ES-H
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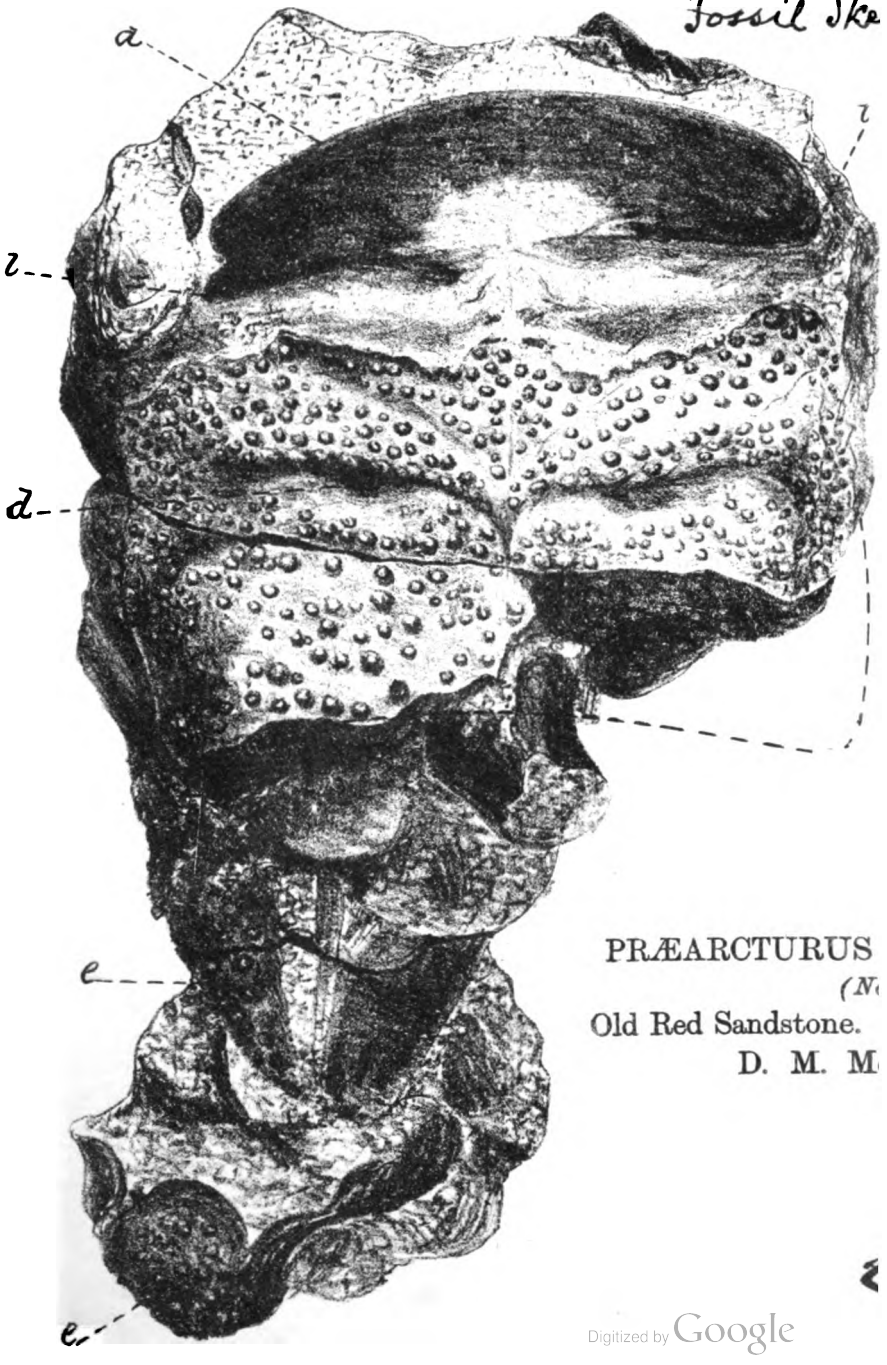

PRÆARCTURUS
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Old Red Sandstone.
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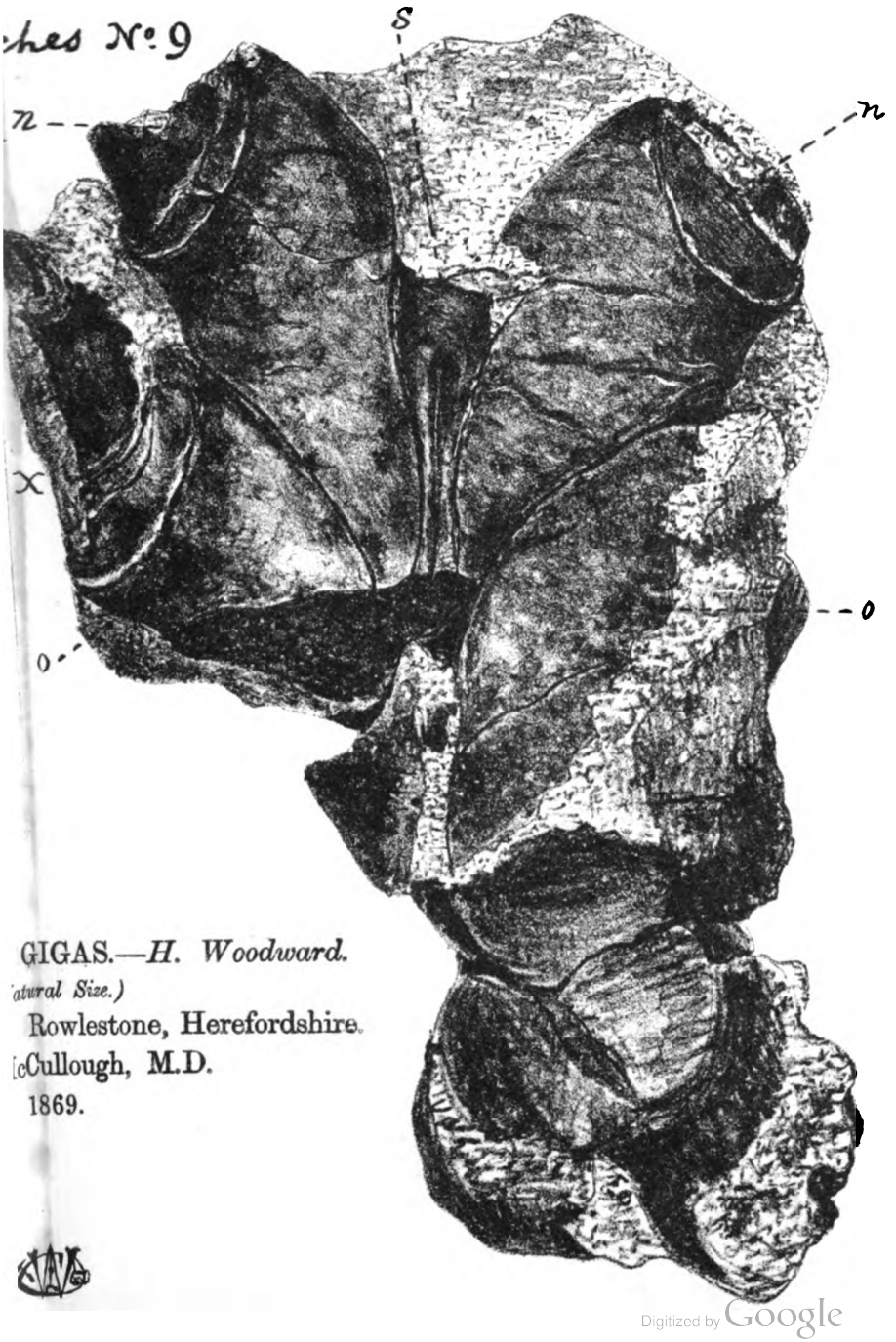
FIG. 2. B.—VENTRAL ASPECT.



GIGAS.—*H. Woodward.*
atural Size.)
Rowlestone, Herefordshire.
cCullough, M.D.
1869.

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TRANSACTIONS

OF THE

WOOLHOPE

NATURALISTS' FIELD CLUB.

(ESTABLISHED MDCCCLI.)

1870.

"HOPE ON—HOPE EVER."

HEREFORD:
PRINTED AT THE "TIMES" OFFICE, MAYLORD STREET

MDCCCLXXI.

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THE TRANSACTIONS OF THE YEAR, 1870.

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The President and Hon. Secretary of the Oswestry and Welshpool Naturalists' Field Club.

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The President and Hon. Secretary of the Severn Valley Field Club.

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West, W. H., Esq.
Westropp, Rev. C. J., B.A.
Williams, Captain.
Williams, Rev. R. H., B.A.
Wood, J. H. Esq.
Woodhouse, Rev. Thomas, M.A.
Wynne, N. S., Esq.

NEW MEMBERS ELECTED DURING THE YEAR 1870.

Alexander, Mr. Joseph G.
Bamford, Rev. Robert, M.A.
Bateman, The Right Honble. Lord.
Blight, Rev. R., B.A.
Bridgewater Colonel.
Clay, Rev. G. H., M.A.
Davies, James Henry, Esq.
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Walkey, Rev. C.C., M.A.
Wood, H. H., Esq.

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RULES

OF THE

WOOLHOPE NATURALISTS' FIELD CLUB.

I.—That a Society be formed under the name of the "Woolhope Naturalists' Field Club," for the practical study, in all its branches, of the Natural History of Herefordshire and the districts immediately adjacent.

II.—That the Club consist of Ordinary Members, with such Honorary Members as may be admitted from time to time; from whom a President, four Vice-Presidents, a Central Committee, Treasurer, and Honorary Secretary be appointed at an Autumn Meeting for the following year, though they shall not take office until after the Annual Meeting to be held at Hereford in the early part of each year. The President and Vice-Presidents to change annually.

III.—The Central Committee shall consist of three members, resident in the city or in its immediate vicinity, with the President Vice-Presidents, and Honorary Secretary *ex-officio*. It shall be empowered to appoint an Assistant Secretary; and its duties shall be to make all the necessary arrangements for the meetings of the year, and take the management of the Club during the intervals of the meetings.

IV.—That the members of the Club shall hold not less than three Field Meetings during the year, in the most interesting localities for investigating the Natural History of the district. That the days

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and places of such regular meetings be selected at the Annual Meeting, and that ten clear days' notice of each be communicated to the Members by a circular from the Secretary; but that the Central Committee be empowered, upon urgent occasions, to alter the days of such regular Field Meetings, and also to fix special or extra Field Meetings during the year.

V.—That an Entrance Fee of Ten Shillings shall be paid by all Members on election, and that the Annual Subscription be Ten Shillings, payable on the 1st of January in each year, to the Treasurer, or Assistant Secretary. Each Member may have the privilege of introducing a friend on any of the field days of the Club.

VI.—That the Reports of the several meetings, and all the papers read to the Club during the year, be forwarded to the *Hereford Times* newspaper for publication as ordinary news, and that the type be re-set in octavo at the expense of the Club, to form (with such additions as may be deemed advisable) the Transactions of the Club.

VII.—That the cost of any lithographic or other illustrations be defrayed by the author of the paper for which they may be required, unless the subject has been taken up at the request of the Club, and in that case the cost of such illustrations to be paid for from the Club funds, must be specially sanctioned at one of the general meetings.

VIII.—That the President of the year arrange for an Address to be given in the field at each meeting, and for papers to be read after dinner; and that he be requested to favour the Club with an address at the Annual Meeting, on the proceedings of the year, together with such observations as he may deem conducive to the welfare of the Club and the promotion of its objects.

IX.—That all candidates for Membership shall be proposed and seconded by existing Members, either verbally or in writing, at any meeting of the Club, and shall be eligible to be ballotted for at the next meeting, provided there be FIVE Members present; one black ball in THREE to exclude.

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X.—That Members finding rare or interesting specimens, or observing any remarkable phenomenon relating to any branch of Natural History, shall immediately forward a statement thereof to the Hon. Secretary, or to any member of the Central Committee.

XI.—That the Club undertake the formation and publication of correct lists of the various natural productions of the County of Hereford, with such observations as their respective authors may deem necessary.

XII.—That Members whose subscriptions shall remain for *three* years in arrear after demand, be held to have withdrawn, and their names shall accordingly be omitted from the list of Members at the ensuing Annual Meeting.

XIII.—That the Assistant Secretary do send out circulars ten days at least before the Annual Meeting, to all Members who have not paid their subscription, and draw the particular attention of all those that may be affected by the operation of Rule XII, to that Rule.

XIV.—That these Rules be printed annually with the Transactions, for general distribution to the Members.

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ADDRESS OF THE RETIRING PRESIDENT,

(REV. H. COOPER KEY, M.A., F.A.S.)

GENTLEMEN,—Now that the time has arrived for me to deliver the President's usual address to the members of the Woolhope Club, it becomes my first duty to say how much I regretted my absence from the meetings of the Club during almost the whole of my year of Presidentship. The reason of this, as you are probably aware, was that a somewhat serious illness in the early part of the summer compelled me to give up work of every description for a time, and leave home altogether for a tour of some duration in Scotland. The good qualities of the Scotch air are proverbial, and I am thankful to have to say that I found no exception in my own case. However much I regretted being absent from your meetings, I have the satisfaction of knowing that my place was so ably filled by our friend Dr. Bull, and other members, that no real inconvenience to the Club of any kind was occasioned by that absence; and my cordial thanks are due to them for their kindness.

Our first meeting last season, the only one I was able to attend, was in the Forest of Deerfold, a district utterly unknown, I think, at the time to nine-tenths of our members, but which had been just previously explored by our indefatigable friend Dr. Bull, who announced the discovery of a Mistletoe Oak in the heart of the district, growing on a farm belonging to the Messrs. Fortey. On our way thither we visited the scene of the labours of an old President of our Club, the Rev. T. T. Lewis, of Aymestrey, to whom, in conjunction with Sir Roderick Murchison, we are indebted for the complete arrangement of that pre-eminently difficult system, the Silurian; and a very interesting and suggestive visit it was. The Rev. W. S. Symonds kindly took advantage of the occasion, at our request, and delivered an appropriate address on the spot. Towards the close of the day some interesting papers were read bearing very properly upon the subject of our excursion. The first was an excellent paper by the Rev. R. Blight, on the "Mode of reproduction and growth of Mistletoe," illustrated by several interesting sections of the plant from microscopic examination; and I feel sure that you will agree with me in congratulating the Club on the addition of so good a naturalist and so accurate an observer to our list of members. The second paper was a very welcome one by the Rev. Thomas Woodhouse on the Natural History of the parish of Aymestrey.

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The next meeting was that at Symonds Yat; at which Dr. Wright, of Cheltenham, gave the members an able address on the Geological Features of the Landscape, and afterwards detailed some discoveries he had made with reference to the Coral beds of the Oolite. Then followed an antiquarian paper by the Rev. Thomas Phillipps on the Royal Forest of Haywood. Dr. Chapman, also, in addition to several valuable papers on Beetles, which he has presented to the Club in the course of the year, read a very interesting paper upon the "Columnar Structure found in Ground Ice," or Ice on the surface of the ground, and he detailed several very interesting features which had hitherto been unnoticed. It is to be hoped that he will continue his observations on this subject in future winters, and extend them to the kindred subjects of "Prismatic Ice," which is one of great interest likewise, and of "River Ground Ice," which has been a vexed question for so many years, and still remains a phenomenon but very imperfectly accounted for. Mr. Southall also presented to the Club an elaborate and most useful paper for reference on the subject of meteorology, which will considerably add to the value of our volume of Transactions this year. In this paper we find tables showing the years of extreme heat, great drought, extreme cold, extraordinary rainfalls and floods, from the earliest authentic records of such events down to the present day.

At the meeting at Llangorse, besides Mr. Lloyd's paper on the fine view from the Allt: and Dr. Chapman's on the Habits of *Platypus cylindrus;* you heard a valuable paper by Mr. Henry Dumbleton on the Island in the Lake, and its probably artificial origin in very early times. The subject is extremely interesting, and a fine field lies open here for further exploration on the part of our members, one in which I think their labour would be amply rewarded.

On August 19th the meeting of the Woolhope and Caradoc Clubs took place on the Longmynd Hills. I myself was in the Isle of Skye at the time, and I observed the date of your meeting noted down in my pocket-book for that very morning, as I was starting on the most interesting expedition I made in Scotland, viz., to the Cuchullin Hills, where, in addition to the most sublime and romantic scenery to be found in Great Britain, there are also the most marvellously perfect remains of the ancient glacial period visible in the existing moraines and ice markings that are to be found perhaps anywhere in the world. Those of our members who may have visited that glorious scene will bear me out in what I say, that to see that sight would be well worth the journey of 500 miles, even if it had to be performed on foot.

The papers read at the Longmynd meeting were the following: a masterly one by the Rev. J. de La Touche on "The Geology of the Longmynd Hills;" an interesting paper by the Rev. Thomas Woodhouse on "The Beech Trees of Herefordshire;" one by Dr. Chapman, on that singular wasp parasite the *Rhipiphorus paradoxus*, whose life history his careful observations have done so much to unravel; and also a valuable paper on "The More Rare Plants of the Longmynds," by Dr. Griffiths, the Honorary Secretary of the Worcester Naturalists' Field Club.

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The last meeting of the year was that appropriated to Fungus gathering and the Fungus feast. Funguses were not so plentiful as usual, owing to the excessively dry season, but Dr. Bull was fortunate enough to hit on a cluster of the *Scleroderma geaster*, a fungus new to Britain. An excellent coloured illustration of it is given with the description by C. E. Broome, Esq., F. L. S. At this meeting an interesting paper on the discovery of Drift in the Woolhope district was read by the Rev. F. Merewether—a paper which, I think, has hardly been appreciated as it deserves. The geological features of the Woolhope district have been made so familiar to us all, from the time when Sir Roderick Murchison explored them down to the present day; and the whole valley has been so thoroughly examined by competent geologists from time to time, that anything new connected with it cannot but excite our interest, but when we were told that every one of these geologists, from Murchison downwards, is mistaken upon one important point which has been repeatedly examined and strongly insisted on, I must confess to a feeling of suprise. You are aware that it has hitherto been an accepted truth that no Drift is to be found in or around the Woolhope valley, with the exception of that small quantity which is obvious to every one in entering through the gorge at Mordiford. Mr. Merewether announced that this is far from being the fact, and that he had found the Drift with its characteristic fossils in other places. The Rev. P. B. Brodie fully confirmed his statements; and being well aware of my friend's habit of understating his case rather than overstating it, I paid a visit of two days to him at Woolhope for the purpose of exploring the district under his guidance in the confident expectation of finding the presence of the Drift conspicious in many other places, and I was not disappointed. The original mass of Drift, so long supposed to be all that exists, is not one hundredth part probably of that which I saw. The road from Mordiford to Fownhope, with the exception of a few breaks, passes almost entirely over the Drift. The entire village of Fownhope itself is to all appearance built upon the Drift, which may be 40 or 50 feet thick, or even more. And again there is a valley, to the S.E. of Woolhope church, the bed of which is entirely formed of drift, acres upon acres in extent, and of a depth no one can conjecture. The strangest part of the case, however, is that Sir R. Murchison, while examining the district, lodged at the Green Man Inn at Woolhope, and every morning as he left the door of the house had a broad section of the Drift staring him in the face, yet he failed to recognise it.

Another interesting circumstance pointed out by Mr. Merewether is the cropping out of the Llandovery Sandstone (which has been amply confirmed since) at the Foulmire's Farm, on the S.E. of Woolhope church, showing that this rock is not confined to the Haugh Wood dome, but extends in other directions, particularly in the direction of May Hill, where it again forms a dome similar to that in the centre of the Woolhope district. I spent two days, as I say, examining these new features, and I am sure that this valley, from which we

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derive our name, is still very far from being fully explored, and will well repay many a long day spent in examining its intricate but most interesting features. The excursions of the Club were then brought to a close for the season, and, as I am informed, to the entire satisfaction of all those who were able to take part in them.

At this meeting Mr. Edwin Lees read a very interesting paper on the "*Algæ* of Drought and High Temperatures," and he has been good enough to prepare with his own hand, for our volume, a coloured plate, to illustrate it. Professor Buckman gave an excellent practical paper on Fairy Rings, which, if it does not solve the difficult enigma of their circular mode of growth, certainly advances our knowledge of the subject in a right direction, Mr. Worthington Smith was very happy in his paper on Tree Fungi; and Dr. Bull brought a most instructive meeting to a satisfactory conclusion by his Herefordshire Edible Funguses, as beautifully illustrated by coloured drawings, as the culinary virtues of the Funguses were temptingly set forward.

At our meeting to-day, besides the careful Meteorological observations, for which we are all so much indebted to Messrs. Isbell, Lloyd, and Southall; the valuable local lists of our Lepidoptera for Leominster, by the family of the Rev. Thomas Hutchinson, and for Whitfield, by Mr. Harman; the interesting Autobiography of Fries and his Photograph; and the lively paper of our own Commissioner on Herefordshire Trees, so full of facts and so well illustrated with photographs; you will have brought before you some recently discovered Herefordshire Fossils, carefully drawn on the stone, named and described by our greatest authority on the subject. These new and interesting contributions to Science, now for the first time published, greatly enrich our Transactions, and give the Club good reason to be proud of our volume. The description by Henry Woodward, Esq., F.G.S., F.L.S., &c., of the British Museum, of the very remarkable Fossil, brought to light by our indefatigable member, Dr. Mc Cullough, at Rowlestone, is especially interesting. Mr. Woodward says, "It reveals a structure unlike that of any palæozoic Crustacean heretofore met with, but peculiarly insect-like." He considers it the remains of a giant Isopod, and he has named it, *Prœarcturus gigas*. The discovery of this strange new Crustacean should quicken the zeal of our local geologists; showing as it does that our old Red Sandstone Quarries, usually thought to be so barren, contain treasures worth searching for.

Again, we have a new species of Eurypterus from Perton, near Stoke Edith, also described by Mr. Woodward, and named by him after its discoverer, the Rev. P. B. Brodie, M.A., F.G.S., *Eurypterus Brodiei*, which is also well illustrated by Lithographic sketches.

And lastly, the same gentleman has described and named the Fossil discovered by Mr. Humphrey Salway, at Leintwardine, some little time since, and which will henceforth bear the name of *Necrogammarus Salweyi*.

I must not omit to mention now a circumstance which must be a matter of congratulation both to the Woolhope Club itself, and the city of Hereford as well;

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I mean the munificent offer on the part of one of our members, James Rankin, Esq., of Bryngwyn, to purchase a site and to erect a suitable building for a museum in the city of Hereford. The report of the committee appointed by the Club to consider the subject has been presented to you to day, and you have seen that the scheme proposed is likely to include a much wider object than that Mr. Rankin originally suggested. All this, however, must remain for future consideration. I think we must all agree with Mr. Rankin that the want of a museum in Hereford is very great, and has long been felt—a place where the collections of private individuals might find a permanent and welcome home—a place where the possessor of a few valuable specimens might bestow them in safe keeping, and be assured that a good use would be made of them; and above all, a place where the student of Natural History and Geology may find specimens which may assist him in his studies. This want I speak of was brought home to me very forcibly some weeks ago on meeting Mr. Symonds, of Pendock, in this city, when he told me he had just been arranging for the reception by the Malvern Museum of the valuable geological collection of Mr. Banks, of Kington, who had lately made a present of it to that institution. Who knows but that, if Hereford had possessed a building such as Mr. Rankin proposes, this collection would not have been lost to the county, as is now the case? I am sure the cordial thanks of the Woolhope Club are due to Mr. Rankin for the liberality he has so judiciously displayed; and I hope and trust that the gratitude of present and future members of the Club will be such that he may never feel occasion to regret that liberality.

On looking back to the past season's work and its results, I think we have good reason to congratulate ourselves on the satisfactory progress of the Club. The number of our members is steadily increasing, so much so as to make it now a matter of some difficulty for our Secretary to provide for them at our meetings; but it is a much more cheering thing to see that we count among us a goodly number of that rare class, the accurate observers and independent thinkers, and that this number is being added to year by year. Valuable as our annual volume of Transactions is, and proud as we may naturally feel of it, we must never rest satisfied with that alone; we must never forget that the great value of this Club, and that which will add lustre to its name, will consist in its being successful in encouraging and pointing the way to patient and accurate thought and research, on the part of all its members, in the study of what is commonly called Science, but which I prefer to call the study of the wisdom and goodness of the Great Creator—a study which if undertaken and pursued in the right spirit, and at the same time with that accuracy and patience I speak of, must be productive of the most precious and enduring fruit to every one who enters upon it.

Passing now from our own more immediate neighbourhood for a moment, let us take a glance at the progress that has been made in scientific questions of interest during the past year. So well are we kept informed by the periodical

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literature of the day of everything that occurs in the domain of science, that it would be easy for me to say much more on this subject than either my own space or your patience will allow. Probably there is no branch of inquiry which cannot point to some more or less important fruit, or at least healthy growth, which the year has produced; but I must not think of dwelling upon them, and I will allude to only one or two questions of more than usual interest and importance which have occupied the scientific world. In connection with the subject I may be allowed to call your attention to a valuable work by Mr. Mivart "On the Genesis of Species"; a work in which the writer emulates the calm, philosophical tone, which is so charmingly displayed by another author, whose conclusions he criticises.

Mr. Darwin's great theory of the Origin of Species still hangs in the balance, as it is likely to do for some time to come; but I think that, notwithstanding the strong condemnations of it we hear from France, as well as from eminent naturalists in America, it still holds its ground, or is rather gaining ground, both in this country and in Germany, as being, if not the whole truth, still an important portion of the truth. And we must all be anxious to receive Mr. Darwin's additional chapter of his theory as applied to man, which has been so long promised but so long delayed,

We were many of us no doubt startled for a time by the account of Dr. Bastian's experiments made last year with reference to the important question of spontaneous generation in conjunction with that able experimenter, Dr. Frankland. This great question will, I suppose, long remain, as it has been for many years past, a vexed question; for although Professor Huxley has pronounced strongly and decidedly against Dr. Bastian's conclusions, and although Dr. Frankland's recent experiments have not confirmed those conclusions, yet neither of them has gone so far as to prove the negative side of the question; and until some positive evidence has been produced on the other side, I suppose we are at liberty to hold any views we may be inclined to on the subject.

There remains one other subject which has occupied a good deal of attention this winter, upon which I must say a few words. I mean the late Solar Eclipse. I believe it is generally considered that the expeditions, which went to the various stations in the south of Europe to observe the eclipse, have returned unsuccessful, owing to the unfavourable weather on the important day; but this is not altogether the case; that which has been done is not all that it was hoped might be done, but still a decided step has been made towards solving that vexed question the nature of the sun's corona. The polariscope observation failed entirely at all the stations, owing to the amount of vapour in the atmosphere, even where clouds did not actually hide the sun; but some observers with the spectroscope were more fortunate. You are probably aware of the distinct object proposed to be attained by the observers with the spectroscope. It was to determine whether the material of the corona proper is different from, or merely forms a portion of, the lower stratum, or gaseous envelope, which immediately surrounds

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the solar photosphere, This has been partially cleared up, and as far as our present knowledge warrants us in stating the matter, the solar envelopes are as follows :—

The Photosphere and Chromosphere (the latter term will probably be before long abolished) form the denser portion of solar atmosphere. This was established previous to the late eclipse. The former is the portion ordinarily visible to the eye in the telescope, is in fact the visible limb of the sun; the latter is visible only in the spectroscope, except during total eclipses, the one being a continuation of the other, and differing from it, if difference it may be called, merely in the diminished pressure of the component gases.

Beyond this we come to a bright, pearly, and very irregular ring, forming the inner portion of the corona, and having to the eye a different character from it. The protuberant irregularities of this ring closely correspond to the red flames or protuberances, which we are all familiar with, and which are now ascertained to be eruptions of glowing gases, principally hydrogen. This envelope seems to be of pretty uniform density or brightness, and does not fade away very much as its distance from the sun increases. It has been proposed to call it the "Leucosphere," or white envelope, but these terms are not likely to hold their place very long, and may be considered as only provisional.

The probability is that this "white envelope" forms, with the positions immediately below it, a distinct part of the solar atmosphere, which seems to be characterised chiefly by the gradually decreasing pressure of the component gases; though in what particulars this atmosphere differs from the outer radial portion hitherto popularly known as the corona proper, it is impossible yet to say.

Beyond this white envelope we find an extensive glow with a marked radial appearance, which has somewhat of a violet colour, tinged with faint rose and green, according to some observers, and gradually fades away, as it recedes from the sun, until it at last takes the form of rays, disappearing in a faint glow. On some occasions these rays have been very marked, as they were during the late eclipse, and commenced at no great distance from the sun's limb.

As totality approached on December 22nd, when the denser portions of the sun's atmosphere were eclipsed, the continuous dark band spectrum gradually disappeared, the telescope remaining pointed always to the same spot, and three bright lines C D and F made their appearance, which was identified by means of the vacuum tube. In a few seconds more C and D disappeared and two sharp bright lines were seen. One of these is coincident with the bright hydrogen line F; the other is on the less refrangible side of b, and is considered to be a new element. The distance of the spot observed, in this instance, from the sun's limb appears to have been about 7′ or 8′.

But here a difficulty arose. Owing to our atmosphere being itself illuminated by this peculiar light it was of course impossible to ascertain its limits, *i.e.*, how far into the corona these bright lines really extended. Now it is worthy of remark, as being probably a point of great importance, that this new bright line

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I speak of, which is considered to indicate a new element, is the very line which has been recognised in the spectrum of the terrestrial aurora. And it becomes an interesting and important question, which, however, is far from being established as yet, whether the solar atmosphere is not in reality a continuous material (whatever its nature may be) increasing in density from the photosphere upwards, the solar atmosphere proper, gradually merging into the corona, and that again into the zodiacal light; which we have good ground for believing communicates with the atmosphere of our planet, and conveys the impulses of irregular outbursts of solar energy, recognised by us in the displays of our terrestrial auroras. This supposition derives additional support from the fact that Professor Angström has observed a bright line which is common to the spectra both of the zodiacal light and the aurora; and thus the connection, long suspected, between solar disturbances, auroral displays in the upper regions of our atmosphere, and simultaneous magnetic storms over the whole surface of the globe, receives, if not a full and satisfactory explanation, yet, at all events, has so much new light thrown upon it that the subject becomes one of the highest interest and importance. Besides these valuable additions to our knowledge of the solar atmosphere, another disputed point has been satisfactorily established by the late eclipse, viz., the fact of the corona being in reality a solar appendage.

It had been held by Mr. Lockeyer and some few other persons that the corona was an effect caused by our own atmosphere, and although they found it necessary to modify this supposition, and to confine it to a portion only of the corona, yet they still partially maintain their former opinion. However, certain photographs, taken during totality last December, at Syracuse and Cadiz respectfully, exhibit a very marked correspondence in the rifts or openings of the corona; and although it is true that all these openings do not exactly correspond, yet, considering the acknowledged variability of the coronal rays, and the circumstance that these pictures were not taken at the same instant, the fact that there is a general correspondence leaves us little room to doubt that the effect is not due in any way to the earth's atmosphere; and again it is stated by Mr. Brothers that two photographs taken by him, with an interval of one minute of time, exhibit in the stereoscope a very decided stereoscopic effect, throwing the corona back from the moon's disc; whereas two copies of the same picture give no appearance of relief whatever in the stereoscope.

Gentlemen, I now close my year of office as President of the Woolhope Club with the expression of my cordial thanks to its officers and members for their kind consideration and co-operation, and my regret that I should have seen so little of them during my tenure of that honourable office. I trust that the Club may long maintain its present flourishing condition, and continue to grow in vigour and usefulness as it grows in years.

Stretton Rectory, Feb. 23, 1871.

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THE REMARKABLE TREES

OF

HEREFORDSHIRE.

THE RECTORY ELM, STRETTON SUGWAS.

APRIL, 1871.

This fine old tree stands in the grounds of Stretton Rectory, at the west end of the Church tower. At five feet from the ground, the stem measures 21ft. 2in. in circumference; and at the height of 35ft. it divides into its main branches. It has lost several limbs- three large ones within the last 25 years—bnt it retains its full height of 92ft, and though the trunk is more or less hollow, it is still a flourishing tree.

This Photograph is kindly presented to the Club by the Rev. H. Cooper Key, the President for the year.

(Ladmore and Son, Photographers to the Woolhope Naturalists' Field Club.)

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The Woolhope Naturalists' Field Club.

MEETING AT THE ANCIENT FOREST OF DEERFOLD.

TUESDAY, MAY 24, 1870.

"Then thick as locusts blackening all the ground,
A tribe with weeds and shells fantastic crowned,
Each with some wondrous gift approached the Power,
A Nest, a Toad, a Fungus, or a Flower."

The Dunciad.

The discoveries made in the Forest of Deerfold during the past year have once more brought this secluded district into notice. Its very name had well nigh been forgotten. Few are ever called upon to visit it, and these would scarcely recognise the name in its present form of "Darvold." "It is six miles from everywhere," said one gentleman, "and generally a good many more."

The Transactions of the Woolhope Club have restored it once again to society, and the Club fixed its first meeting of the year to see its Mistletoe-oak, to gather the Asarabacca on the spot, and to visit the actual place which was the refuge of some of the leading Lollards during their persecution some 500 years ago.

By a skilful arrangement of rail and coach, and favoured by the present lovely weather, the visit has been accomplished most satisfactorily. Conveyances had been sent on from Hereford to the Kingsland station, and on the arrival of the train at 10.10 a.m. they were well freighted with passengers.

The ground first traversed was that so rich in historical associations, the celebrated battle field of Mortimer's Cross. Many gentlemen present saw this beautiful and extensive plain—the great west plain as it was formerly called—for

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the first time, and but few could hear the descriptive account so ably given *en route* by Mr. Flavell Edmunds. It was the last battle fought on Herefordshire soil, and beyond question the most important. It revived the fortunes of the House of York at a time when they seemed almost hopeless, and placed the victor on the throne. Mr. Edmunds published the best account of this battle some years since, and a brief summary of his excellent paper cannot fail to be acceptable.

The year 1460 closed with great gloom for the House of York. At the battle of Wakefield Green, December 30th, 1460, Richard Duke of York was slain, and his head, surmounted in mockery with a paper crown, frowned above one of the gates of York. His youngest son, the Earl of Rutland, was barbarously murdered by Lord Clifford in the pursuit; and many of the staunchest Yorkists in the north were dead or in prison. This brilliant success for the House of Lancaster raised their hopes to the uttermost, and it only remained for them to crush the young Earl of March before he could overcome his father's death. Orders were therefore given by the Queen to Jasper Tudor, Earl of Pembroke, and James Butler, Earl of Ormond and Wylshire, to advance into Herefordshire and attack him. They at once did so, and joining the Lancastrian troops which occupied Leominster, they drove the Yorkists from their posts on Cursneh Hill and Eyton and marched towards Wigmore, to seize the castle and ravage the rich domain of the Mortimers.

The young Earl well justified Queen Margaret's fears. He was only twenty years old, but his manners were good and prepossessing, and the energy and courage with which he met the reverse of his party won the hearts of his followers. He had raised an army amongst his Herefordshire friends and tenants, and joined by Griffith ap Griffith and many of the Welsh was preparing to march northwards to meet the victorious Lancastrians, when the news of this attack reached him. Quickly reversing his steps he marched homewards to defend his ancestral castle.

The evening of February 1st, 1461, found the Lancastrian army on the great plain, their right commanded by the Earl of Ormond, the centre by Sir Owen Tudor, and the left by his son, the Earl of Pembroke. The young Earl Edward, was believed to be far away collecting his friends and adherents. The Lancastrians expected, therefore, to find only the garrison of Wigmore Castle and such few troops as could hastily be got together to oppose them; and great must have been their surprise as the day broke to see the Yorkists before them drawn up in close battle array at the entrance of the beautiful valley of Aymestry.

The young Lord of Wigmore, knowing the ground, had very skilfully taken up his position to oppose the Lancastrians. His left was protected by the river Lugg, his main body in one solid column occupied the narrow valley, and his left was on the high ground above the present inn at Mortimer's Cross. The morning was cold, some snow lay upon the ground, and Edward's army was awe-struck on observing in the clear pale sky that singular phenomenon which

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is not unfrequent in more northern latitudes, a parhelion, or mock sun. To the eyes of the amazed troops three suns appeared in the sky, which gradually merged into one. "The iii sunnes sodainly joined al together in one."—HALLE.

> "Three glorious suns, each one a perfect sun;
> Not separated by the racking clouds,
> But severed in a pale clear shining sky.
> See! see! they join, embrace, and seem to kiss,
> As if they vow'd some league inviolable;
> Now are they but one lamp, one light, one sun."
>
> HENRY VI., pt. 3, act 2, sc. I.

Edward "improved the occasion" as adroitly as did his ancestor, William, when he converted his fall, while stepping ashore at Pevensey Bay, into a formal "seizin" of the soil. "Yonder three suns," cried Edward, "are the three Lancastrian leaders, Pembroke, Tudor, and Wylshire, whose glory shall this day centre upon me." The prophecy proved a true one, and probably helped not a little to produce its own fulfilment.

The battle quickly began, and soon became general along the whole front. It was fought with the greatest obstinacy. The first success fell to the Lancastrians. The Earl of Pembroke was opposed to the right wing of Edward's army, which was its weakest point, and attacked it with such vigour as to compel it to give way. It retired, however, still fighting bravely, and he, too eager to complete its overthrow, pursued the retiring troops for a distance of three miles. Meantime the main body of the Yorkists, under Edward himself, forced by the nature of the ground to take the solid column, afterwards so fully carried out by Napoleon, fell with irresistible force on Lord Ormond's division, which was immediately opposed to him. Lord Ormond's troops were chiefly Irish, and so terrible were the wounds made on their half-naked bodies by the bills in the hands of the Herefordshire men, that though they fought bravely they were soon broken and forced into flight. The strong columns of the Yorkists then fell with the same force on Sir Owen Tudor's Welshmen, who, now left unsupported on either side, had to bear the whole brunt of the battle, and were gradually compelled to give way.

When the Earl of Pembroke returned the battle was lost. Instead of falling on the flank or rear of Edward's troops in the narrow valley, as he had hoped to do, he had to meet the same strong column that had overcome the other division in the open plain. He fought with the utmost valour to redeem the day but in vain. It was a second battle as fiercely contested as the first. The Lancastrians, under the brave old Sir Owen Tudor, had called up their last reserves, and then came the news that the Yorkists in Leominster had arisen and seized the unguarded baggage at Kingsland. Thus attacked in front and rear, the flight became general, and the victory complete.

The precise number of troops engaged on either side is not known. At sunset of this "bloody Candlemas Day," as it is locally called, the Lancastrian army no longer existed. Three thousand eight hundred men lay dead and dying on the field (Halle), and many others were taken prisoners. Edward's loss did not exceed four hundred or five hundred men. The Earl of Pembroke

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and Lord Ormond escaped, but Sir Owen Tudor and four other Welsh chiefs were taken prisoners, and several gentlemen of Herefordshire who sided with the Lancastrians—Sir John Scudamore and his two sons, Thomas Fitzhenry, John Throckmorton, and some others. They were taken to Hereford and eight of them beheaded next day: a fearful retaliation for the slaughter of the Yorkist prisoners after the battle of Wakefield.

Edward joined the Earl of Warwick at Chipping Norton, near Gloucester, as soon as possible marched on to London, and was chosen and proclaimed as King, in St. John's Field, Clerkenwell, on March 3rd, and was eventually crowned June 29th, 1461.

The young Earl showed great decision and energy throughout. The rapidity of his movements is remarkable. Like Napoleon in later days, he fell unexpectedly on his enemies and gave them no time to concentrate their forces. Thus, with probably a less number of troops, he contrived to outnumber and conquer in succession each division of the opposing army. Edward probably slept at Leominster the night after the battle. He was in Hereford the next day with all his disposable troops, and in twenty-eight days led them into London;—thus averaging over five miles a day, a feat which must have required wonderful energy, considering the difficulties he had to overcome.

But to return to the progress of our Naturalists. The trysting spot for the commencement of the day's explorations was the bridge at Aymestrey, and here, meeting from all quarters, a goodly company assembled. Many were the friendly greetings of the brother naturalists on this the opening day for the season.

The village of Aymestrey is one of the most beautiful in Herefordshire. Its church and houses are prettily clustered near the most contracted portion of the valley. The richness of its alluvial soil is shown by the size and height of the timber, and the great variety of trees there prove that taste has not been wanting to add to the natural beauty of the place. The river Lugg gives to it, perhaps, the greatest charm of all, as it winds murmuring through the valley from beginning to end. Its waters are so much more bright and clear and rapid than they appear a few miles further south, that it scarcely looks like the same river. The Lugg here truly bears out its old British name—Llug—the bright river.

Aymestrey, and the district around it, is classic ground for the geologist. The physical features are most striking. The upper Silurian rocks—the Ludlow formation—prevail throughout, and the narrow valleys and steep hills they present, not only give great beauty and grandeur to the scene, but afford a most instructive lesson to him who would read aright their varying characters. To the members of the Woolhope Club in particular, Aymestrey and its district will ever claim an additional interest. One of the earliest Presidents of the Club, the Rev. T. T. Lewis, resided here for many years, and studied the rocks around him with a patience and perseverance beyond all praise. To him it was first granted to trace out their successive formation, to learn their varied character,

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and to collect and classify the fossils peculiar to each. It was Mr. Lewis's facts and observations that gave to Sir Roderick Murchison the first clear view of that system of rocks which by further and more extended observations he was enabled to lay down with such admirable precision, as the Silurian System.

Mr. Lewis was President of the Woolhope Club in the year 1853, but in the autumn of the year before he led the Club from Mortimer's Cross Inn by Croft Castle over Croft Ambury, and along the escarpment of Yatton Hill, visiting the quarries throughout the route, and explaining from time to time the geological features presented by the hills and valleys around. In his "Retiring Address," delivered at Hereford, January 24th, 1854, Mr. Lewis gave a brief description of this meeting, and goes on to say: "In our descent to Aymestry we took the path of an old road, up which I had the honour of conducting Mr. Murchison (now Sir Roderick) in his first visit to Herefordshire, July, 1831, presenting in itself a continuous section from the Lower Ludlow Rock to the Old Red Sandstone. I had at this time very fairly developed the structure of the surrounding country. My own researches in this district commenced with my residence at Aymestrey, in 1827; but I was working in the dark, and it was in that walk, which I continue to regard as one of the most interesting events of my life, there dawned upon me the vision of the deep interest of the then comparatively unknown country in which it was my good fortune and happiness to be dwelling, and to the true development of which I had, unknowingly, discovered the key, and made some progress. With what zeal, industry, ability and success, Sir Roderick Murchison has followed up these beginnings, and prosecuted the identification of these rocks through our own and the adjoining counties, and the greater part of the North of Europe, into Asiatic Russia, is shown by his great works on the Silurian System (1838), and the Geology of Russia and the Ural Mountains (1845), and the various scientific journals of the time."

The pleasant memory of that meeting was vividly revived, as such few members of the club who had the good fortune to hear Mr. Lewis then, followed the President and Mr. Symonds, on the present occasion, along the river's side to the Common Wood Quarry, where the search for fossil and plant began. Here the limestone—called, from its marked development in this village, the Aymestrey limestone—offers a fine bold surface, and is seen to be deposited in successive layers from one to five feet thick. It is a bluish grey limestone and highly fossiliferous, containing numerous layers of shells and corals, and there is one calcareous band which contains an abundance of that fine fossil shell, *Pentamerus Knightii*, which is characteristic of the formation.

Very little time was spent here, for at the Garden Wood Quarry the Aymestrey limestone presents its typical characters in a still more marked degree.

Returning by the river, the party was very kindly taken by Mr. Shipley through the gardens of the quarry, following once more the exact route taken

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18 years ago under the guidance of Mr. Lewis. With kind consideration the key of the rooms in which Mr. Lewis's fossils are still kept was placed at the disposal of the club, and now, as then, they were open to examination. The offer was gratefully appreciated, but as it could not be done justice to—considering the long route before the club—it was thought better to go at once to the quarry. Here some men were at work, and every opportunity was afforded to examine the nature of the stone, and secure some of the characteristic fossils. The very full attendance at the meeting became very evident as the members crowded into the quarry, "Thick as locusts, blackening all the ground"; but as they did not seem much inclined to hunt for the fossils, much less to get them out, the President requested the Rev. W. S. Symonds, president of the Malvern Field Club, to give them a brief address.

Mr. SYMONDS, mounting the appropriate rostrum of a fine layer of Aymestrey limestone *in situ*, then said that it was impossible to stand in that quarry and not be forcibly reminded of an old President of the Woolhope Club, the Rev. T. T. Lewis, the first man who studied Silurian fossils, and who first correctly established the divisions of the upper strata of the Silurian rocks—and of that master mind Sir Roderick Murchison, who taking Mr. Lewis's discoveries as his ground work, succeeded by indomitable perseverance and energy in producing that grand result, their complete arrangement, as the Silurian System. Sir Robert Murchison was an old soldier. He was attached to a Herefordshire regiment in the Peninsular campaign. After Waterloo had been fought and won, and when a general peace was happily established, his active mind could not be at rest. He could not be idle, and having a natural taste for Geology he went to the veteran Professor Sedgwick and asked him what was the most promising field of geological study. His answer was "Go down, Murchison, to the borders of Herefordshire and Wales, you will find there the Graüwacke, a series of strata that nobody understands. Try to coordinate them. I will work at the Cambrian rocks and we will see together what can be done to arrange them." Thus did Sedgwick and Murchison, brothers in science, set to work, and many a friendly struggle had they before they decided on the limits of these rocks as we know them now.

Sir Roderick came into Herefordshire, into the country of the ancient Silures, and then it was that he had the good fortune to visit the Rev. T. T. Lewis in this village, and the sagacity to point out to Mr. Lewis the grand result towards which his facts and fossils so directly tended. Mr. Lewis's information so freely, so unselfishly given, stimulated Sir Roderick's zeal to the uttermost. He spared neither time, nor thought, nor money. His whole energy was given to the subject, and when not at work with his hammer and pencil in the field, he was using his pen with equal vigour and effect, and ceased not until he had laid down a system, not for Herefordshire or Wales alone but for the whole world. Mr. Symonds then entered into many details with reference to the Silurian fossils, and concluded a very eloquent address by conveying to the Club the hearty good wishes of Sir Charles Lyall with whom he had been

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engaged on the council of the Geological Society during the past week. "Tell them," said this veteran philosopher, "to continue their field work with steady perseverence and new wonders will reward their labours."

Mr. Symonds' address, given as it was on the spur of the moment, was listened to with much pleasure, and was duly acknowledged by the President amidst the general applause of the club.

There was still no apparent disposition to work, and a stranger might well wonder whether the hammers present were for ornament or for use. They certainly seemed only to be used in a gentle *dilletante* style, as if their owners cared not for the interesting fossils, of which the rock is full. Some few shells were got, but the friendly aid of a quarryman was strongly to be suspected in obtaining them. It might be perhaps that time was short, as it really was, for the botanists had been strictly ordered not to wander. Where so much has to be done, and so much ground to be got over in a short time, the necessity for strict punctuality becomes absolute. Or it might be that the spirit of romance had possession of the club for the day, and that all thoughts were bent on the ancient Forest of Deerfold, the Druids, and the Lollards. Be this as it may, the whistle was quickly sounded, and "back tracks" were taken to rejoin the conveyances. The ride to the Forest was pretty and interesting. Gradually rising from the valley of the Lugg the road winds around the base of round-backed hills, whose tops were marked out by the dark foilage of small plantations of Scotch fir. The river itself was extremely pretty, and even the mill stream which runs in such close proximity to the road, looked tempting. It needed not the skill of a Lavater to point out the fishermen of the party. Indeed there could scarcely be any lover of good scenery present who would not like to be a fisherman, for the excuse to follow up that lovely defile where the Lugg flows between the steep wooded hills of Shobdon on its right bank, and the Sneyd wood in the Forest on its left. Still up, up, the road went, through Lower Lye, round the base of the great hill Over-Lye, until the stiff formal allotments made at the last enclosure of the Forest on the Camp hill came in view. The sharp eyes of a botanist detected a fine bunch of Mistletoe on a silver-barked poplar *(Populus canescens)*, which deserves a note since the parasite rarely gains a settlement on this particular kind of poplar. Some fine large bushes of Juniper were also observed growing in the hedge by the road side, the last remnants of the former wildness of the place.

Another steep pitch down to the Dickendale brook, and another sharp ascent, and the Haven was reached. Here the Messrs. Fortey welcomed the Club. As the carriages successively arrived, their occupants dismounted, and crossing a small field found the orchard in which grows the Mistletoe-oak.

"We read in ancient story
How Druids in their glory
Marched forth of old, with hooks of gold,
To forests dim and hoary;
The giant oak ascended,
And from its branches rended
The Mistletoe, long, long ago,
By maidens fair attended." *Thomas Miller.*

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The bunch of mistletoe in the oak was so large that it could be exceedingly well seen from the adjoining lane, notwithstanding the foliage of the tree. "There's no mistake about it," said one gentlemen, as if he thought there possibly might have been, its portrait and the description in last year's volume of the Club notwithstanding! A ladder had been placed against the tree, with the same thoughtful consideration to every detail that could add to the pleasure of the visitors that prevailed throughout the reception, and it was soon mounted. There was no white yearling bull with garlanded horns to sacrifice beneath the tree for the festivities, nor was there an Archdruid to cut the mistletoe with a golden sickle—indeed the Druidical programme was rather reversed on the present occasion—but anyway the mistletoe bunch was reached and gathered amidst three rounds of applause that were given by the assembled multitude below, and small sprays of "the heaven born plant unpolluted by any touch of the earth" were distributed to the ladies present and to all others who wished for it.

A great surprise now awaited the members. The Messrs. Fortey had prepared a grand entertainment for the visitors. Here was the boar's head and hams, roasted bustards and peacocks, heron pies, venison pasties, &c., with a bountiful supply of good old metheglin or mead in ample skins. No, no! This was what there would have been if the festivities had been held 2,000 years ago. The pies to-day were of pigeon and veal, whilst chickens, and beef, and lamb, and tongues, and hams, with all right and proper additions, loaded the table. What was to be done? The heads of the Club looked grave as they remembered their rules, which ignore all entertainments, and thought perchance of the modest baskets that had been sent on to the Castle at Wigmore. Was this the exuberant, irrepressible hospitality which belonged to the ancient Forest that set all other laws but its own at defiance? or had the Messrs. Fortey borne in mind that high festivities were a necessary accompaniment of the ancient Druidical ceremony of cutting the mistletoe from the oak? The question, however, was soon settled. In the true spirit of philosophy the members "took it kindly"—

> "They set them downe, and made good chere,
> And eate and dranke full well."
>
> *Ballad of Adam Bell.*

But picturesque as was the whole scene, merry and gay, a veil must here be drawn on it. Something is due to the mystic character of the plant—

> "Oh, Oh, the mistletoe!
> Ah! nobody knows, nor ever *shall* know,
> Half that's done under the mistletoe."
>
> *Barry Cornwall.*

Let it be well understood then, to be safe, that only such business matters are here eleminated as it behoves a faithful chronicler of the Club to enter on its archives. The President, in the name of the Club, begged the acceptance by the Messrs. Fortey of the volume of the Transactions now in the press, which contains the history of their ancient forest, in pleasant recollection of the very hospitable

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and generous reception they had given to the Club to-day. The Rev. R. Blight and J. H. Knight, Esq., were elected members of the Club, and several new members were proposed. Sundry other business announcements were made. The President read an excellent and appropriate paper "On the Mode of Growth of Mistletoe," by the Rev. R. Blight, which created some little discussion; and, lastly, a well-written paper, "Notes on the Natural History of Aymestrey," by the Rev. Thomas Woodhouse, was heard with much satisfaction.

The signal for advance was given, and in joyous humour the gentlemen set forth towards the Camp, the highest ground in the forest. The way led through the Haven fold-yard, through the orchards that had produced the excellent cider for which the forest is noted, and along the side of the Haven dingle, a deeply scooped coomb of denudation, clothed on either hand with trees picturesquely disposed. They were all of modern growth, and did not recall the days of Robin Hood so well as stern gnarled oaks, wych elms, and other forest denizens of English birth would have done, yet they gave a most pleasing aspect to the scene, and inspired sylvan thoughts with that "Divine oblivion of low thoughted care," only to be obtained away from the contentions of the busy world. Under the eye were numerous horse-chesnut trees beauteous in their white corymbs of conspicuous flowers, while on the opposite side of the glen were dark masses of firs and larches—the attempt of man to clothe the rugged surface of Nature's baldness with the garment of utility. The indigenous forest is gone, but the planter restores it in another form.

The views were good and varied as the path wound round the head of the dingle towards the "Encampment" as it is called, and as the whole extent of forest was surveyed it could be seen to be "a valley of elevation," as geologists term it, of the Lower Ludlow rocks, not isolated, but stretching away to the west out of sight. "The Encampment" itself is a mere circular trench in the centre, planted inside with a ring of Scotch firs, with another ditch almost obliterated, inclosing the high ground of the hill. It would seem only to have been occupied for some temporary purpose. Ralph de Mortimer may have formed it during his attack on Edric Earl of Shrewsbury, who then held Wigmore Castle; but, in the absence of all relics left by the occupiers, whether it may have been British or Mediæval can only be the subject of conjecture. From the highest point of the hill a wild yet exciting prospect is exhibited, characteristic of this sparsely populated part of Herefordshire, for scarcely a church or human habitation comes into the range of unassisted vision, and Cowper's "lodge in some vast wilderness" seems truly exemplified. Only deep glens and hills rising one behind another, brilliant in the foreground with golden gorse in its culmination of flowering, or shadowed by the passing cloud in the middle distance, rise before the wondering view, till the horizon is bounded by the blue eminences of Shropshire, like precipitous walls propping the heavens.

> "The bursting prospect spreads immense around,
> Stretch'd over hill and dale, and wood and lawn,
> With verdant field and darkening heath between,
> To where the broken landscape by degrees
> Ascending roughens into rigid hills
> That in the far horizon dusky rise."

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Thus the view may be scanned pictorially, but a more solemn feeling is induced when the geologist sees the basaltic Clees towering grandly far away in the prospect, and knows that all this panoramic display is due to the uplift of the various Palæozooic formations by the vulcanic outburst that in remote ages imagination can scarcely revert to, raised vast beds of coal and deposited strata from the abysses of the primeval ocean, and elevated to the clouds all the formations previously laid in horizontal positions.

The height of the encampment in the Forest of Deerfold was carefully taken by Dr. M'Cullough by barometrical observation, in conjunction with E. J. Isbell, Esq., of Hereford, and it was found to be 912 feet above sea level. The altitude of the hills in the central parts of the county are as follows: Dinedor, 605 feet above sea-level; Haugh Wood, 622 feet; Credenhill Camp, 715 feet; Backbury, 728 feet; Seagur, 886 feet; Egdon, 842 feet; Acornbury, 916 feet; and Garway, 1,195 feet above the sea. This hill therefore ranks amongst the highest in Herefordshire.

But from the prospect of the hill and the reflections it inspired it was necessary to advance in accordance with the programme of the day; and the naturalists keeping to the high ground for some distance up a green romantic lane, came to the wondrous "Golways pool," which sadly wants an appropriate legend. Though on the very brow of the hill this pool is deep and always full of water in the driest of summers. Led by that indomitable observer, who has brought to light so many hidden secrets of the ancient Forest of Deerfold, the way was taken over mossy ground down the mountain side and through rugged lanes until on the inspiriting cry of Dr. Bull a sudden pause was made, at a stony bank. Here that very rare and local plant the Asarabacca was pointed out to the delighted botanists. Knife and spud and trowel were quickly at work and such plunder was made of the Asarabacca now fortunately in flower, that if it had not here long luxuriated and extended itself untouched for years, it might have run the risk of being exterminated. But however it may have got here, there is now enough to fill the vasculums of all the collecting botanists who may be able to find out the spot without a guide, and do not mind a long ramble to this forest seclusion.

This curious plant the *Asarum Europæum*, is said in our Floras to be only found in "woods in the North;" and Herefordshire has never been suspected to harbour it—so this is "one to the good" for Mr. Purchas's Flora of Herefordshire. Its broad shining reniform leaves and solitary dull purple flowers give it so peculiar an appearance as not to be mistaken. But what is to be said as to its being "truly wild" at this location?—though now spreading as freely as if Nature had planted it here. It must be remembered that it was formerly cultivated in rustic gardens, and even in the north of England and Scotland where it grows, it is said by those who have observed it, to be "apparently naturalized;" so here probably—

> "Near yonder copse, where once the garden smil'd,
> And still where many a garden flower grows wild,"

it may have been planted in the garden—perhaps of some gentle nun or mediæval hermit—whose little plot a succeeding cottager may have kept up, until in the

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civil contentions, once unhappily so rife in England, plundering soldiers, like those mentioned by Southey in his "Battle of Blenheim," may have done here as they did to the unfortunate occupant mentioned by the poet:—

"They burned his cottage to the ground,
And he was forced to fly;
So with his wife and child he fled,
And had not where to lay his head."

Doubtless the Asarabacca has been very long naturalized here, as shown by the hold it has taken upon the ground, but to endorse its growing here in the days of Caractacus is more than can truly be done. Near the same spot the many-flowered Solomon's Seal (*Polygonum multiflorum*) was gathered by several of the botanists, and this is also indicative of garden cultivation.

When the botanists had contented themselves with specimens, the high ground of the Forest had again to be surmounted, and the road was kept for a considerable distance. Here a division took place, a few gentlemen kept to the programme, and had a lovely walk round the northern boundary of the Forest, whilst the main body went direct to the Chapel Farm house, which has recently had so much attention drawn to it as the actual spot, and probably the chapel itself of the Lollards, in the 14th and 15th centuries. The high ground of the Forest on its northern side dips down suddenly into the extensive plain below. The walk round its edge is singularly fine, and the views from it are varied and interesting. The plain itself is rich and smooth. It might be, as it probably once was, a vast lake, and beyond it, with Harley's mountain and the little conical tree-covered Berkeley's knoll in the foreground, a succession of hills upon hills stretch in every direction. Happy he who had with him the Ordnance map to make out their various names, and recognise Brampton Brian park hill, Coxwall knoll, Caer Caradoc, and the numerous other summits of interest in view. It was a long round, but for varied interest and beauty on such a day, it takes rank with the finest scenery of Herefordshire.

At the Chapel Farm the parties reunited, and glad enough were many of the wearied explorers to be refreshed with a draught of the "famed Silurian juice," as Phillips, the cider-poet, expresses it, which was liberally supplied by the kind and attentive resident of the place. The Forest district affords a greater up and down pilgrimage than had been calculated upon by many, and before the day's work was done, the "under five miles walk" of the programme must have been greatly exceeded, for in such a country a crow's flight may not be taken by a featherless biped.

The Chapel Farm house has little about it to attract attention on a first aspect, but the more closely it was examined the more it grows in interest, and the more all those interesting features come out—its position east and west—its rich carved-oak beams and roof ties of the XIVth. century. and its communion table with the moveable top of a somewhat later date, and which have been so minutely described and so well sketched by Mr. Blashill in the Woolhope Club's Volume of Transactions for 1869, that it is not necessary to allude to them further. That this place was the refuge of some of the leading Lollards during

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the great persecution which began in 1389, there can be no reasonable doubt, and a great service has been done to the history of the county in restoring these facts to general knowledge.

A small orchard near the house is called by tradition "The Burial Ground" and two yew trees are there, which are the only things remaining which seem to support the tradition. Yew trees are very uncommon in the Forest, and none exist there with the exception of two or three near Limebrook Abbey, two miles away. These trees are of some size. One measures 9 ft. 5 in. in circumference at 3 ft. from the ground, but it splits into two trunks shortly afterwards, and one is broken off, leaving the other 6 ft. 4 in. in circumference. The second tree is more perfect, and at 5 ft. from the ground it measures 8 ft. 10 in. in circumference. If the old saying with reference to the growth of the yew tree be correct, viz: that for every foot in diameter you must allow a century, and it would probably require a still greater allowance, these trees may be almost considered to date with the Chapel House. Behind the house is also a walnut tree of the rather unusual size of 12 ft. in circumference at 5 ft. from the ground.

The route was now resumed towards Wigmore Castle and first passed over a meadow all verdant with the leaves and fruit of that poisonous herb Saffron, or Colchicum, and where also the frog orchis, *Habenaria viridis* and the *Orchis morio*, were gathered.

A deep copse, which bordered a stony lane, had next to be surmounted among crumbling Silurian strata, dry as ancient and modern baking from beneath and above could make it, and to the top of this hardened road the explorers pressed on, and after toiling up another height the ruins of Wigmore Castle, long the stronghold of the renowned Mortimers and their regal successors, was descried.

Descending from this high ground, the members of the club were gratified with a magnificent panorama, embracing the whole alluvial valley which in the Confessor's time was a moor or marsh and gave a descriptive title to the district. Etymologists dispute whether the name Wigmore* is a simple derivative from "wick" and "more" and therefore an equivalent of the old English "merestun," or whether it preserves a trace of those Danish rovers or vikings who, there is some reason to believe, settled themselves in one or two spots along the Roman road between Aymestrey and Leintwardine. It must be confessed that the vestiges of the Norseman are few and sink into utter insignificance beside those which his kinsman, the Norman, has left in the ruined fortress which forms a conspicuous feature in this noble landscape.

Approaching the Castle from the west it is easy to see what was the original form of the structure. A massive keep was reared upon the west of the hill, which on its northern side needed no further defence than that which nature had given. Below this and connected with it by a battlemented wall was the first line of works, inclosing a courtyard or bailey of no great extent. Lower still, and

* There is another Wigmore in the adjoining county of Salop—a hamlet in the parish of Westbury.

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joined in the same manner, was the external wall, very strong and defended at frequent intervals by massive towers, a steep escarpment and two moats. But the fortress which in the days of the Mortimers had laughed a siege to scorn was easily invested by the members of the club who crossed the moat, no longer even "a brochet some time dry" as Leland found it, and entered the walls through many a gaping breach which time rather than violence had effected.

Within the lowest, or outermost, ward of the castle an agreeable surprise awaited the antiquarians of the party. In erecting a small shed a few days previous to their visit, the discovery had been made of an arched chamber occupying the basement of one of the angle towers to the left of the entrance gateway. By the courtesy of Mr. Harrison, of the Greenhill farm, who made the discovery, every facility was afforded for the examination of the vault, access to which was gained by a flight of roughly hewn steps. At the foot of these is a square-headed trefoil arch, the jambs of which are almost as perfect as when first chiselled; and within a few feet is a second and similar archway, admitting by rather a precipitous descent to a dark chamber of some four yards square. The roof is groined and in admirable preservation; the walls bear traces of plaster, and in them may be seen, at a height of four feet from the ground, the remains of two stout iron staples. It is evident from the position of the hinges that the door opened inwards; and this fact, combined with the position of the chamber in the outer wall, rather favours the supposition that it was used as a cellar, though at times it may have served as a strong room for prisoners. The date of this part of the castle is probably the same as that of the gateway, and both may be referred to the latter part of the Edwardian era. Adjoining this cellar or dungeon is a similar chamber, which, however, had not been opened, and was said to have a wooden roof. In excavating the steps some fragments of stag's horn, bolts, hinges, and an old lock were found, and among the tiles exhumed was one bearing the old royal arms, gules, three lions passant guardant in pale or. There can be little doubt that beneath the soil in the outermost ward many interesting objects of antiquity lie buried, for this portion of the castle must have been occupied as late as 1579 (when Sir Robert Harley was born within its walls) and fell into gradual ruin, which was only consummated when the Parliamentarians dismantled the whole fabric in 1643.

So extensive and fragmentary are now the ruins of this once grand fortress, that much of its beauty and picturesque effect is lost. It is a study for the antiquarian rather than for the artist. Its chief interest lies in its history, and to realise its former importance the imagination must be called upon, and the history of the Mortimers and their royal descendants. The naturalists roamed as long as time permitted about its ivy-clad ruins. Some of the stems of the ivy trees are of monstrous dimensions. They examined its unconnected masonry, and wondered where the varied stones were brought from to enrich the more modern parts of the old building. They peopled once again in imagination its walls, its terraces, and its court-yards, with its ancient warriors, its lords, and its ladies. Edward IV. and all his gay court of lords and ladies, with the Lady

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Anne of Warwick as lady paramount, were there again. Archery and falconry would be their sports in common; or, leaving the ladies, hunting would be the order of the day:—

"All the long summer's day rode the king pleasantlye,
With all his princes and nobles eche one,
Chasing the hart and the hind and the buck gallantlye
Till the dark evening forced all to turn home."

"The King and the Miller of Mansfield."
Percy's Reliques.

It was time, however, to separate. The great majority of visitors had to catch the evening train at Leominster, and taking a hasty glance at the interesting church of Wigmore they joined the coaches at the inn in the village.

A few still remained to linger awhile about the castle ruins—to visit once more the chapel of the Lollards—to pass again the mistletoe oak, whose renown is henceforth established—and to bid a kind farewell to their hospitable friends at the Haven.

The following plants, in addition to those already named, were gathered during the day, about whose claims to nativity there could be no doubt:—The pretty golden-flowered Needle-whin, *Genista anglica*, though a rare plant, was there in considerable abundance; the sweet briar, *Rosa rubiginosa*, truly wild; and the hairy-leaved rose, *Rosa villosa*; the wild service tree, *Pyrus tormentalis*; the mountain ash, *Pyrus aucuparia*; the raspberry, *Rubus Idæus*; the beautiful wood vetch, *Vicia sylvatica*; the elegant water-avens, *Geum rivale*, whose crimson-tinged pendant flowers were favourites of the late Sir James Smith, who made "English Botany" so famous in his day. In a little pond the *Potamageton crispa* was also found. The *Vaccinium myrtillus*, *Calluna vulgaris*, *Polygonum Bistorta*, *Tormentilla officinalis*, *Myosotis collina*, *Viola hirta*, *Chelidonium majus*, *Cynoglossum officinale*, *Asperula odorata*, and many others.

Dr. Griffith H. Griffiths also observed the following cryptogamic plants:—*Hypnum splendens*, *albicans*, *murorum*, *riparium*, *triquetrum* and *denticulatum*; *Phascum subulatum*, *Dicranum scoparium*, *Gymnostomum microstomum*, *Jungermannia bidendata* and *epiphylla*; with the *Lichens*, *Verrucaria rupestris*, *Urceolaria scruposa*, *Borrera tenella*, *Lecidea porosema*, *Lecanora subfusca* and *glaucoma*, *Coniocybe furfuracea* and *Leptogenum lacerum*. The weather had been dry too long for many mosses and Lichens to appear.

Passing once again through Aymestrey in the evening twilight, another remark of the Rev. T. T. Lewis was called to mind, "It is an advantage of our 'Field days' that they must send us to our books; whereas owing to the *vis inertiæ* of our nature, the perusal of the very best books will not necessarily send us into the field; for this reason, most strictly one of bodily and mental enjoyment, Naturalists' Field Clubs are worthy of all encouragement."

The following members and visitors took part in the day's proceedings:—The President, the Rev. H. Cooper Key, M.A., F.R.A.S.; the Vice-presidents, Rev. Arthur Gray, M.A., and Elmes Y. Steele, Esq.; Hon. Secretary, the Rev. Sir George H. Cornewall, Bart.; the Rev. W. S. Symonds, F.G.S., President of

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the Malvern Field Clubs; Edwin Lees, Esq., F.L.S., Vice-president of the Worcester and Malvern Field Clubs; Dr. Griffiths H. Griffiths, Hon. Secretary of the Worcester Club; R. M. Lingwood, Esq., F.L.S., Exeter; R. Lightbody, Esq., F.G.S.; Rev. B. L. S. Stanhope; Rev. Wm. Stanhope; Lieut.-Colonel Symonds; C. J. Kent, Esq., Upton-on-Severn; Arthur Armitage, Esq.; Dr. M'Cullough; Rev. H. W. Phillott; D. Lawrence, Esq.; Rev. J. C. Robinson; John Lloyd, Esq.; Rev. B. Dawson; W. H. West, Esq., Gliffaes, Crickhowell; Rev. R. H. Williams; Dr. Bull; Rev. E. Du Buisson; Rev. R. Hereford; Thomas Cam, Esq.; Rev. H. W. Tweed; Rev. E. J. Owen; Powell Symonds, Esq.; F. C. Harrington, Esq., H.M. 14th Regiment; J. Griffith Morris, Esq.; Rev. James Davies, Moorcourt; Rev. Thomas Green; C. G. Martin, Esq.; Rev. H. B. Marshall; D. R. Harrison, Esq.; Thomas Blashill, Esq.; W. Miller, Esq.; Rev. F. T. Havergal; Rev. H. J. W. Stillingfleet; Flavell Edmunds, Esq.; Rev. C. Pilkington; F. R. Kempson, Esq.; John Lambe, Esq.; Rev. T. T. Smith; James Davies, Esq.; F. Herbert, Esq.; Rev. J. H. Jukes; George Cocking, Esq.; O. Shellard, Esq.; Henry Moore, Esq.; T. W. Fortey, Esq.; C. Fortey, Esq.; Mr. and Mrs. James Fortey; Dr. Purchas; Mr. Alfred Purchas; Capt. Trollope; Rev. Chas. Trollope; Mr., Mrs., and Miss Turner; Mr. Downing; Mr. F. E. Harman; Mr. Cook; the Misses Owen; Mr. John Andrews; Mr. Josh. G. Alexander, and Mr. Arthur Thompson.

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NOTES ON THE REPRODUCTION AND GROWTH OF MISTLETOE.

BY THE REV. R. BLIGHT.

The Mistletoe, *Viscum album*, has a very strong claim on the students of Botany from the fact that it is the sole English representative of that family of *Loranthaceæ*, which affords so many genera of tropical parasitic plants and so many objects of wonder and admiration to the traveller in tropical forests. But it is the mystery connected with its parasitic growth which gives to it so peculiar an interest to the Naturalist. With these reasons for inquiry, I would claim the indulgence of the members of the Woolhope Club for an account of some investigations into the life-history of this remarkable plant, which may most certainly be regarded as one of the chief treasures of the Herefordshire Flora.

The Flower.—"The simplest form of flower is that in which only a few foliar organs are converted into anthers, and between them the simple extremity of the axis displays itself as the simplest form of leaf-bud." (Schleiden, Principles of Botany, 145). Uniting the pistiliferous and staminiferous flowers of the dioecious mistletoe we obtain such an ideal flower.

The epiphyllous stamens deserve especial notice for they afford an instance of *dehiscence by pores* of a remarkable character, cross partitions forming several septa.

"Further, we may also notice with reference to the flower of *Viscum*, that there is not any distinction or division of the axis as pedicel, from the axis as seed bud. The axis terminates immediately in the flower, with a scarcely evident rounding of the extremity, and all that gives it peculiar import to the seed bud, namely, the formation of the embryo sac, as well as the subsequent development of the embryo, is carried on in that part of the axis below the flower, that is, in the pedicel." (Schleiden.) "The structure of the inferior ovary of the *Loranthaceæ* has been much misunderstood. If cut across, there is no cavity containing an ovule to be seen. This is owing to the circumstance that the sides of the ovary are adherent to the solitary, erect, naked ovule, so that no distinction between ovary and ovule is apparent." (Oliver.)

According to Decaisne, the ovule is not formed until six weeks or two months after the fertilizing action of the pollen on the stigma.

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Few structures certainly offer more suggestions to the mind of the student than the simple and seemingly insignificant mistletoe flower, especially if it is compared with such an elaborate structure as, for instance, the flower of *Ranunculus ficaria*, which appeals to the notice of the botanist at the same season.

The Seed. The white berry, with its delicate pale green venation, is too well known to need special description. After the viscid substance is got rid of, which, by the way, is a somewhat difficult matter, seeing that viscin is insoluble in water, even in a boiling condition, we find a single seed in each berry. A section of one of these is very interesting. Three vertical sections are shown in figures 1, 2, 3. These exhibit what are usually called the radicles; but which it would be perhaps better to call by some other name, since they differ so much in function and form from the usual type of radicle. They may therefore be called *processes*, for want of a better name. Yet it must be understood that this term *process* is not used to the exclusion of *radicle*, but merely to denote a portion of the radicle.

These processes vary in number. Out of 36 seeds selected on account of their uniform size and apparent perfection, 25 had two, 7 had three, while 4 had only one process. They are cylindrical and club-shaped. By gently boiling the seed for a few minutes they may be dissected out entire, with the plumules between the embryonic cotyledonous leaves. The difference in colour between them and the general mass of the seed is so great that much of their character may be made out by the unaided eye.

These processes each form a separate plant. It has never been shown that these separate plants are of different sexes, but it is highly probable that they may be so; and if so we should have an explanation of the fact not unfrequently seen, of male and female plants being united in the same bush.

Continental botanists have paid great attention to the germination of the seed. The experiments of Du Hamel and Dutrochet, showing it to be truly parasitical, have been already noticed in a paper on Mistletoe by Dr. Bull, in the Transactions of this Club for 1864, and therefore need not be further noticed here.

Numerous experiments were made with a view to testing these. Mistletoe seeds were deposited on tiles, bottles, pots of hardened earth, watered with pure water, or with water containing potash, and every instance fully agreed with the results of former experiments. Water containing potash was used, because it is known that the tissues of Mistletoe contain a greater per-centage of potash than the tissues of the tree on which it grows.

One experiment, in which the seeds had been deposited on a tile, was brought to a premature conclusion, just as the processes began to protrude beyond the body of the seed, by an unexpected enemy of Mistletoe. The seeds were found one morning being consumed by a party of ants. As every specimen was spoiled, the ants were allowed to finish their work, which they soon did, leaving nothing but a few pieces of skin. Can it be that saccharine matter, produced

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in the process of growth, made the seeds palatable to the ants? Another experiment also disclosed another enemy to the seeds, in a mould, which attacked those deposited on a bottle surrounded by a spiral band of wool for the purpose of keeping the seeds moist.

From the numerous experiments of Du Hamel, Richard, Dutrochet, and others, it would appear that the deposit of the seed on *living* matter is a necessary condition of continued growth.

The growth of the Mistletoe plant on the tree now claims our attention. The usual position of the plant on the under surface of the branch has been accounted for by saying that the birds, in the act of cleaning their bills, manage to get the seed on the lower surface. An hour's watching will easily correct this. Missel-thrushes, song-thrushes, fieldfares, and blackbirds when feeding on the seeds swallow them whole, just as they do yew or holly berries. The seeds, deprived of their viscous matter, which is for the most part digested, are ejected ordinarily in masses of from eight to twelve. Such masses generally fall on the upper surface of the branch, and the rain mechanically carries the glutinous seeds to the under surface, where they ultimately establish themselves, the viscous matter still about them being sufficient to make them adhere firmly to the bark. The progress from the upper to the lower surface is often slow. In this case the processes are swelling during the interval, and in several instances under observation the seed reached the under surface in an advanced stage of growth.

During this period and for some time after, they have to encounter more persevering and dangerous enemies than the ants or the fungus already alluded to, in the various species of Tita. These birds appear to have a peculiar faculty for discovering the deposited masses of seeds and bringing observations upon them to an untimely end. This accounts also for the fact that considering the immense number of Mistletoe berries, which are to be seen every year, few seeds are to be found in an advanced stage of growth, and thus we have a good illustration of Darwin's remark that "no fallacy is more common with naturalists than that the numbers of an individual species depend on its powers of propagation."

After the seed has been deposited and the viscous matter has disappeared, the processes begin to push their way through the dead coverings. They advance parallel to the bark until they attain the length of from $\frac{1}{4}$ to $\frac{3}{8}$ of an inch. The club-shaped end bending downward then becomes a disc, not unlike in section to a boy's sucker. After some time, which has yet to be ascertained, a radicle descends from the centre of the disc and penetrates into the bark. The penetration of the bark by the radicle is all the more remarkable because the cellular tissue of which it is composed is so much softer than the liber of the tree, that in a few minutes after a section is made, the tissue of the Mistletoe radicle shrinks so as to form a hollow in the surface of the section. From an examination of the section which fig. 5 represents, it appears that the radicle penetrates the epidermis of the bark, in a pointed form, turning up the bark on all sides in advancing. On reaching the cambial layer, it begins to swell into a spherical form, and in this shape occupies the external layers of the alburnum. The tissue of the alburnum,

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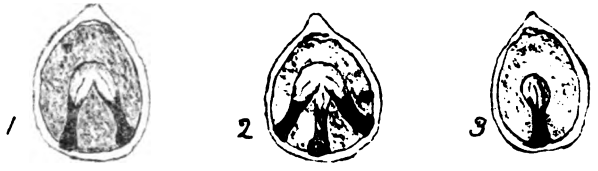

Figs. 1. 2. 3. Sections of Seeds shewing the processes. (× 3)

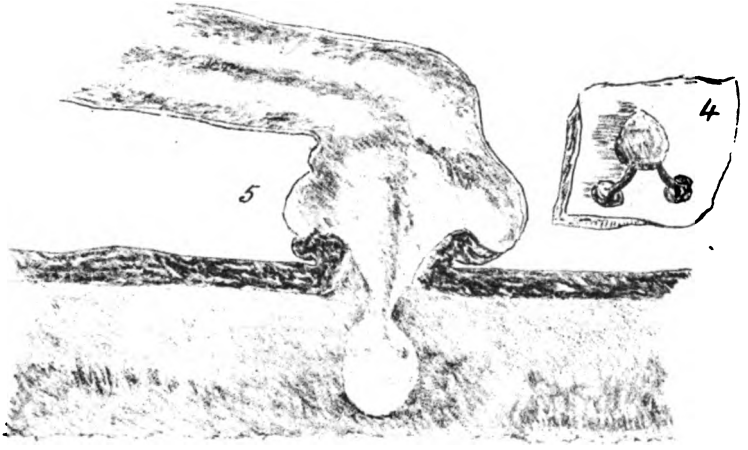

Fig. 4. Seed throwing out processes on bark of Magnolia.
Fig. 5. Process attaching itself to bark. (× 25)

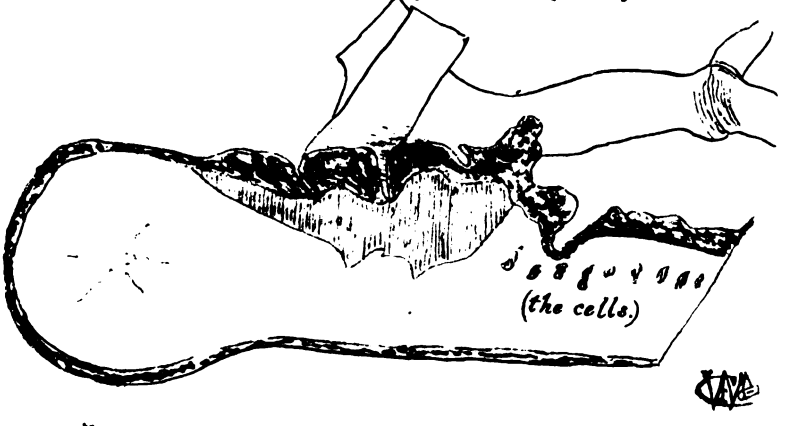

Fig. 6. Section of Poplar shewing cells of Mistletoe.

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round the point of the radicle, exhibits decided signs of compression, curving round the outline of the Mistletoe tissue. In addition also to the union of the cells of the advancing radicle, it would appear that the larger cells of the disc unite with those of the cambial layer, so that nutriment is supplied to the young plant not only by the advancing root, but also by the whole surface of the disc. The dark green centre of the Mistletoe process sends down a very fine series of cells, slightly darker in colour than the rest, into the substance of the advancing spongiole.

The word "penetration," which contains the pith of the whole, needs some justification. The seed from which the section just described was made was deposited on the bark of a *Magnolia tripetala*, a soft wooded tree, on February 6, 1869. During the whole of the summer the processes made but little progress. It was during the autumn that the greatest apparent growth took place. At this time the bark of the year might be supposed to be complete. A section made on November 25, 1869, from a seed, deposited at the same time with the one alluded to, exhibited no such decided appearance as that described above.

The seed alluded to contained *three* processes, all of which germinated. Until the beginning of November they remained convergent, being attached to each other by the tissue of the body of the seed. But at that time, when the substance of the seed had been entirely absorbed, they became separate plants, and parallel, as noticed above.

The history of the *seed* ends here, at present. It is to be hoped that further observations and experiments will elucidate new stages, and so dispel the mystery which at present enshrouds the plant.

Propagation of Mistletoe by Rhizomes.—The Mistletoe plant having once become established upon any given tree, soon begins to increase by another mode of reproduction. This is effected by means of rhizomes, exactly corresponding to the underground stems of terrestrial plants. This fact may be commonly seen, but a marked instance of this mode of growth is given by Dr. Bull in his paper on Mistletoe, before alluded to, with regard to the mistletoe oak of Frampton on Severn, where, when it had killed the bough of the tree on which it grew, a fresh plant of Mistletoe shot out from the trunk. To this mode of rhizomatous reproduction is mainly due the abundance of Mistletoe on the trees on which it has once established itself.

The proof that this is the case may be practically shown. *Firstly*, on examining the bark of a branch occupied by Mistletoe, small protuberances of the peculiar mistletoe green colour may be found. These break out with no regular dehiscence: a leaf-bud is at once developed without any traces of the two cotyledon leaves. *Secondly*, the young plants, found in such numbers on the trunks of old apple trees, cannot always be due directly to seeds. They may be dug out with fully half an inch of dead dry bark above the surface of the living bark; a depth of substance, which, judging from the experiments previously alluded to, and from the shape and character of the process, the

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radicle from the seed would not penetrate. *Thirdly*, if one of the yet unbroken protuberances be traced down by means of thin horizontal sections, it is found that the portion under the bark is, in many instances, for some distance irregular in shape, exhibiting such an appearance as might be expected in cutting through a mass of tissue parallel to the bark.

The proof of a decided connexion between two plants of Mistletoe on the same branch has not yet been found; and this is not to be wondered at, when we consider how small such a connexion may be.

Mode of Growth of a Plant on the Tree.—A transverse section of Mistletoe on a branch usually shows a central root and one or more side roots, all of which are generally directed towards the central pith. A curious deviation from this was seen in the case of a plant which had grown in the angle between two branches. The central root was directed between the centres.

The explanation of such a section as that which is represented at fig. 7 is this—the radicle after having penetrated the bark and cambial layer, from which it derives the greater part of its nutriment, gradually advances through the alburnum, then pushes its way through the mature wood towards the central pith. This is proved to be the case by the fact that we find roots actually penetrating to the pith, in one case even the point of the radicle just missed the centre of the pith and had passed it; and we must allow the twig or branch to have *at least one ring of wood* before the deposit of the seed, or the advance of the rhizome. While the root is thus advancing towards the pith, the Mistletoe expands laterally in the liber of the branch, where an additional growth is provoked, so to speak, by the irritation of the parasite. This additional secretion of new wood is so great as to cause the central pith to become eccentric.

The lateral expansion of the Mistletoe causes a sort of corm or crown of the root to appear, which continues to expand in all directions, following the curvature of the branch. At certain points it sends down additional roots, which penetrate the wood in the same way as the original root. In this way the roots on either side of the central one, in a transverse section, and the numerous wedged-shaped ones, in a longitudinal section, are accounted for. This lateral expansion, in some cases, goes on until the branch is almost entirely surrounded by a ring of Mistletoe, with its roots converging towards the centre, like so many spokes of a wheel. Thus the Mistletoe carries its own death with it, for, by living, it deprives itself of the "means by which it lives."

In some cases this lateral expansion, instead of pushing the bark up before it, encloses it. Fig. 7 (a) shews a portion of bark enclosed between two roots, but fig. 8 is worthy of especial notice, for by it the penetrating power of the roots is undeniably proved. The section is one of an apple branch, which was itself exhibited at the last meeting of the club. It is a quarter of an inch in diameter. The bark enclosed is of the same date as the bark of the branch, and forms a continuation of it, beyond the root of the Mistletoe, which has enclosed it. The enclosed portion of the bark (a, fig. 8) shews the masses of

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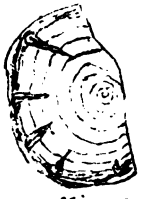

Fig. 9

Fig. 9. Mistletoe on apple:—
Rootlets penetrating to different depths.

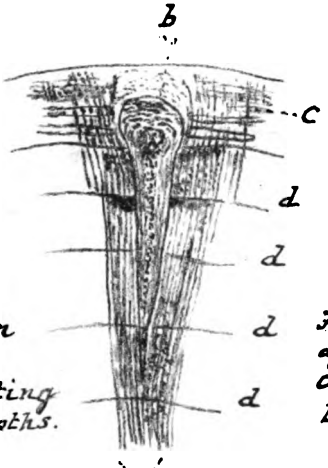

Fig. 11.

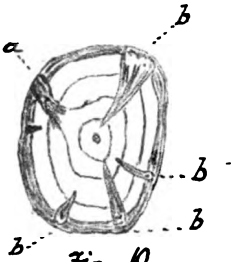

Fig. 10

Fig. 10. Mistletoe on apple:—
a. bud of apple,
b. mistletoe rootlets.

Fig 11. Mistletoe rootlet × 8 diameters:- a. medullary rays; b. mistletoe rootlet; c. layers of apple bark; d. rings of annual growth.

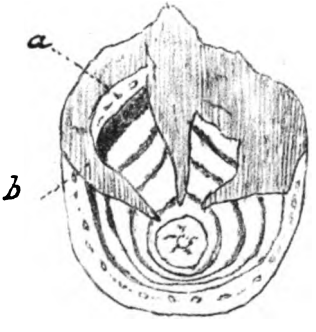

Fig 8.

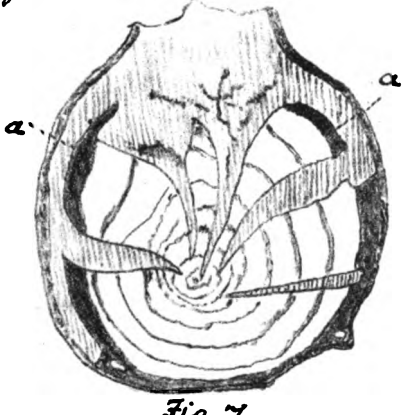

Fig 7

Fig. 7. Section of Lime with Mistletoe :-
a. old bark.

Fig. 8. Section of Apple with Mistletoe :-
a.. bark enclosed in the space of a year;
b.. rootlet which has enclosed the bark.

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pleurenchyma in the liber as distinctly as the unenclosed; whence it results, as a matter of necessity, that the bark has been enclosed since last spring, and that the root of the Mistletoe, which has penetrated within two layers of wood towards the pith, has grown fully a quarter of an inch within the short space of *at most eight months*. We may conclude, therefore, that this section sufficiently proves the power of the soft Mistletoe tissue to penetrate the hard wood of the supporting branch.

Another appearance, disclosed in a longitudinal section, deserves particular notice, from its connexion with rhizomatous growth. Fig. 6 represents such a section, showing cavities, marked "cells," filled with Mistletoe tissue. As far as can be made out by an examination of such a section by reflected light, as well as from the fact that very soon after the section is cut the Mistletoe tissue shrinks almost entirely away, the tissue is of a later date than the surrounding wood, and cannot have been enclosed. These cells must therefore be the result of the power of the Mistletoe of sending out rhizomes. They suggest to the botanist the "runners" of such plants as the strawberry, and it seems highly probable that they perform a similar function, by forming centres, from which, as the rhizome descends to the trunk, new plants may find their way to the bark.

There is one other feature disclosed in a section which must be noticed. If a leaf-bud, which is protruding through the bark, be followed down by cutting thin sections, it occasionally presents the following appearance:—The section commences as an irregular mass, showing sometimes, at a little distance below the surface, two centres, from which contorted medullary rays spring. These centres, as the section descends, become more distinct, until ultimately the root becomes two separate masses. It would appear from this that the roots of the Mistletoe have the power of bifurcating within the branch of the tree, as well as of sending down roots from the expanded crown outside the bark.

These notes are necessarily disjointed. Any attempt to weave them, at present, into a continuous history would be premature. They are merely thrown out for the purpose of calling forth more observations; and if they provoke discussion and examination, they will have met with in an ample reward. When observations have been multiplied and conclusions verified, the life-history of this our most remarkable parasitic plant will be no unworthy addition not only to botanical literature in particular, but to physiology generally (applause).

EDWIN LEES, Esq., F.L.S., said that as an old student and lover of the Mistletoe, not only at Christmas but at other times, he felt inclined to make a few remarks on the subject. The paper just read embraced much research but was of such a technical character that it was difficult to follow its details when read in the field, and it required to be carefully read and considered at home. He agreed with the author of the paper that the seed of the Mistletoe when germinating generally produced two processes that attached to the tree became two distinct plants, but he was not prepared to say that these plants were generally

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male and female. Indeed he thought it was not so, as, according to his observation, the staminiferous and pistiliferous plants were almost always separated if not on different trees, and hence arose a difficulty as to how fructification took place. They must bear in mind that the Mistletoe being dioecious, one plant only produced stamens and another pistile, and it was only from the latter that the well known white berries were produced. He thought that the author of the paper might have carried his observations further, and showed how the pistiliferous plant of the Mistletoe was fructified, and whether any insect was concerned in the process as Darwin had shown was the case with many other plants. This was a point that required attentive consideration. Looking at the matter in an economic point of view, it was evident, on looking at the apple tree in view before them, almost dead from the persistent attack of the parasite, that Shakspere was quite correct in his reprobation of the plant as "the baleful Mistletoe." As long as the tree existed the Mistletoe fed upon its juices, but in finally destroying the tree it killed itself. He had some years since written an account of the Mistletoe, and the various trees on which it had been found, and he then had an idea that the plant was useful in carrying off the redundant juices of the trees on which it grew, cupping them like the process once much in vogue in taking blood from the human subject. On this his friend Dr. Bull, who had written a very learned and exhaustive paper on the Mistletoe, and better understood its physiology, had cut him up most sharply—he might almost say villainously—(laughter); and he had been unable to retort upon his learned friend, but should bear him in mind at his next publication, and try the cupping process on him (hear. hear). He believed, however, that the fact really was, as stated by his friend Professor Buckman, that the Mistletoe stimulated a young orchard tree to an earlier and more prolific production of fruit, although it caused a premature decay of the apple-tree. Thus it might be advantageous to a farmer who was looking only to a few years' cider production, but it was detrimental to the owner of the soil (applause).

The R v. T. T. SMITH drew attention to a subject referred to in the paper just read, viz.: The power which the processes of the Mistletoe had to penetrate the annular layers of woody fibre of the tree on which it grows. A few weeks ago he had favoured the commonly received opinion that these processes, deriving their nourishment from the cambium layer, were gradually surrounded with woody fibre by the growth of the stem. To settle the question in his own mind he had procured some specimens, and made sections of apple stems with the Mistletoe adherent. The result had fully convinced him that these processes actually penetrated the wood. Some mistletoe sections were then shown to the members, and attention directed to the following points:—1. The wedge-like form of the processes. 2. That they lay on the course of a medullary ray, and none of these rays were obliterated, but pushed aside, as a fine wedge would do it. 3. The fine points of the processes were formed of new cellular tissue, while the centre of the broader part of the wedge was more dense in structure. 4. That in some instances the same rhizome had sent *four or five* processes into

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the wood, and these had penetrated to different depths, some to the ring of the previous year, others half-way between that and the ring of older growth, while some had even entered the first year's wood, and were approaching the pith. In one section he had made the pith had actually been reached. There was another fact mentioned in the able paper which had been read which the members of the Woolhope Club could confirm on the spot. If any would ascend the Mistletoe Oak near at hand, they would find that the plant of mistletoe upon it had spread downwards beneath the bark of the oak, and by its pressure had elevated it so much as to split it, and also that from it new plants of the present year's growth are appearing (applause).

Dr. BULL said the Club were very much obliged to Mr. Blight for the excellent paper he had given them. It showed much work—careful observations made in the field, and interesting experiments at home; and had really advanced our knowledge of Mistletoe growth. When he himself took up the subject of Mistletoe for the Club some few years since, he could get but little information about it. The best account of it by far, was that written by Mr. Lees in the *Botanical Looker Out*, and he thought it was still the best and most interesting account. If any gentleman present did not know this book, he begged strongly to recommend it to them as one of the most useful and entertaining books on British wildflowers—a book that any one fond of botany could not put down without reading it throughout. It had been published some years now, and when he heard Mr. Lees asking why Mr. Blight had not carried his observations further, he could not help wondering why he had not done so himself (laughter). They had just had the pleasure of electing Mr. Blight a member of the Club, and if he continued his observations he had no doubt but that he would meet Mr. Lee's desire for further information. The last elaborate paper on Mistletoe physiology was written by Dr. John Harley and read before the Linnæan Society, and in a letter he (Dr. Bull) had received from Dr. Harley since this time, he laments that he had neither time nor opportunity to inquire particularly into this point amongst others—whether the Mistletoe roots had the power to penetrate the hard wood of the tree? Hitherto it has been thought that the Mistletoe root was arrested by the hard wood, and that it only becomes imbedded in the wood by the successive layers as they were found annually surrounding the root. Here he thought Mr. Blight had done good service in almost proving that the Mistletoe roots have the power of penetrating the layers of wood already formed. Mr. Blight had shown Mistletoe sections, and those brought by Mr. Smith to-day supported them well in showing that the soft cellular root enters the hard wood itself and sometimes penetrates even to the pith. He (Dr. Bull) was convinced that it had this power of penetration, and as in all the sections the roots grew larger from the point to the base, there must be considerable compression or absorption of the hard wood to make way for the soft tissue of the Mistletoe. The point was very interesting physiologically, for it seemed to bear out the view that in vegetable as in animal life, the tissue with the lowest vitality had to give way to that which possessed a higher degree of it—as the bones of

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animals were absorbed to make way for soft structures, so it would appear that the hard wood of the tree had to give way to the soft cellular growth of the Mistletoe. He did not think this quite proved, because though great compression was evident there yet wanted evidence of absorption to make the analogy complete. He thought if they examined the section made by Mr. Blight and Mr. Smith, or better still, if they made sections for themselves, that they would come to the same conclusion these gentlemen had, that the soft cellular Mistletoe root had the power of penetrating the hard wood in the direction of the medullary rays. He would only mention in conclusion two other reasons in support of this view which had not been named—one was that the section of Mistletoe root if simply enclosed by each annual growth of wood, would have a notched edge corresponding with each year, instead of being as it is a wedge with perfectly smooth outline, and the other was, that when a Mistletoe seed took growth on a small twig of one or two years' growth, as is often seen on the lower branches of lime trees in particular, it invariably killed the bough—whereas Mistletoe sections constantly show the roots on the very first annular layer of wood. The section Fig. 7 of Mr. Blight's showed no less than six roots penetrating almost to the centre, and had it continued to grow there the branch could not possibly have lived (applause).

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NOTES ON THE NATURAL HISTORY OF AYMESTREY.

BY THE REV. THOMAS WOODHOUSE, M.A.

The parish of Aymestrey, in which we are now assembled, is one of the most remarkable in the whole district to which our excursions extend. It embraces in its wide extent great variety of soil and situation, hill and valley, rock and pasture, and especially woods, that cover a very large area.

In geology it is classic ground; for it was here that my kind friend of early years, the Rev. T. T. Lewis, investigated the order of succession of strata in the upper members of the Silurian System, labours referred to and acknowledged by Sir R. Murchison; who says, in one passage:—

"The central member of the Ludlow formation was named by me after the beautiful village of Aymestrey, where the rock is well laid open, and where its relative position and fossil contents were elaborately worked out by my friend, the Rev. T. T. Lewis."

How patient and careful those researches were none can doubt who had ever the happiness of knowing that humble-minded and unassuming man, one of the least ready to parade his own knowledge, one of the most ready to communicate his knowledge to others.

"Sic vos non vobis mellificatis apes."

The conformation of the country gives great facilities for the examination of its geological features. Deep narrow valleys intersect it in various directions: steep abrupt hills, in many cases clothed with wood, disclose their internal structure by many a picturesque crag and quarry.

The Lugg enters the parish at its western extremity and traverses it for above five miles; it flows through a valley, or rather a succession of three valleys, of remarkable beauty. At first it passes at the foot of the northern declivity of Shobdon hill, through meadows often shaded by that gloomy and lonely ridge; its banks everywhere fringed by alders, its waters tenanted by

"Here and there a lusty trout
And here and there a grayling."

Below the stone footbridge at Lye Pole the valley is narrower, and the hills for some distance steeper than before. After it turns towards the village, it has more space for the curiously tortuous windings which distinguish it. At Aymestrey it turns again, and after running southwards for about a mile

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it leaves the hills, and the parish of Aymestrey, altogether behind it. It is in the steep hill-sides right and left of these valleys that the quarries and rocks occur in which most of the more remarkable geological features may be noticed.

I leave further details on this subject to abler hands than mine; but I may be allowed to direct your attention to one point which has long struck me.

In the rock just above the weir at the foot of Grayley Wood, by the side of the road to Lingen, the strata are most curiously bent upwards into a curve, as if by some upthrust from below; although in the quarry on the one side and the rock on the other no such disturbance is perceptible. Perhaps the conical shape of the hill itself may not be entirely attributable to denudation.

Going northwards from Aymestrey along the turnpike-road, which is said to coincide in the main with a Roman road from Bravinium to Magna, we cross the water-shed between the Lugg and the Teme, between the Wye and the Severn. A little stream, which rises not far beyond the village of Yatton, finds its way, not as might be expected into the Lugg, but into the Teme. No very considerable rise of ground marks the division, and from thence a wide and somewhat open valley stretches northwards for some distance.

Such a district, so wild and so diversified, furnishes, as may be expected, a great variety both of birds and plants. My opportunities of observing them have of late years been but few, and were never made the most of, yet I have by me a list of 75 species of birds observed here. Some of these are doubtful, and some only observed once; but by far the greater part are certainly to be found.

Hawks abound, the kestrel especially, finding abundance of food and shelter. There used always to be ravens on Croft Ambrey (which, by the way, is in this parish), but I rather think they have been exterminated. I well remember the strange metallic clang of their croak as they flew overhead. Jackdaws inhabit the church tower, and survey the world with great complacency from the weathercock, always facing the wind. That bright and lively bird, the water ouzel, abounds here. I have often heard one singing in the coldest weather in winter, undismayed by the frost, though actually standing in the water. Aymestrey bridge is an excellent place for watching their curious movements from, their quick bobbing motion when standing, their rapid darting flight, andtheir struggling dives under, or rather through, the water. The song is sweet and varied, but not very easily heard, because the bird is fond of singing close to broken or falling water, the noise of which drowns his voice.

The fern owl may be heard here on almost any calm evening in the early summer. I have seldom seen one, and suspect that they seldom fly abroad until it is too dark to distinguish them from bats, which in flight they much resemble. One very favourite haunt of theirs is the corner of the great wood above the quarry, near the inn, where the short oaks and beeches doubtless furnish them with food. Three kinds of wagtails occur here, the gray and the yellow, as well as the common kind.

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This place is a great resort of swallows and their kindred. The Sand Martin builds in many places; there used to be great numbers of nests, and perhaps are still, in the abandoned quarry on the left hand just before entering the village from Mortimer's Cross. Swifts build every year in the church tower, and I think they must build also in the rocks above Lye Pole, for I have seen them sailing round there, high in the air. Their shrill scream is associated in my recollections with the long, bright days of early summer. The Kingfisher often shoots past us by the river-side; the Heron may not unfrequently be seen standing in full enjoyment of "the contemplative man's recreation." Since the destruction of the Heronry at Willey, one wonders where these stragglers come from. I have most often seen them near Lye Pole. Perhaps they build somewhere in those solitary woods.

I have said nothing of song birds, though we have a full chorus of them. There is, however, one strain wanting, which is, perhaps, the sweetest of all, that of the Nightingale. I think I have been told that others have heard, or thought they heard it. I certainly never did; and I have been accustomed to the song of the Nightingale for many years, and do not think I could mistake it. [I am living now in a favourite haunt of Nightingales, and often hear them near my own house both by day and night.]

But, to pass on. The variety of trees and plants here is extraordinary. The woods and copses, for instance, instead of being composed of one or two kinds of tree only, include almost every wild forest tree. Oak prevails; and one's first impression on looking at the wooded hills in summer is that they are clothed with oak; but autumn reveals the great variety of other trees which really exists, and brings them into the most picturesque relief. The Wych Elm flourishes here in great abundance and beauty; the Beech, the Mountain Ash, the Wild Cherry, the Maple, and the Sycamore occur in profusion.

The underwood chiefly consists of hazel and young oaks. The coppice wood is generally cut down and cleared off at intervals of about twenty years, some taller standards being spared; and as this process is going on every year in some part or other of the many hundred acres of wood which this parish contains, one is always sure of finding some open spaces amidst the

"Boundless contiguity of shade."

From such clearings the eye catches the most charming glimpses of woodland, hill, and valley; and underfoot they are often carpeted with flowers of the gayest hues. In the first year of the clearing the ground is of course covered with little else but broken wood and dead leaves; but in the next year and the one following, before the young coppice has sprung up much, large patches of vegetation appear. One kind of plant generally extends over a large area; foxgloves, for instance, may be sometimes found by the acre. In such cases one must suppose that the seeds have laid dormant ever since that piece of ground was open to sun and air before, perhaps twenty years ago.

Considerable quantities of charcoal are made here. The charcoal burners pitch their rude huts on some clearing in the woods, and often remain there

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throughout the summer. The level patches on which the heaps are burnt, blackened with small fragments of charcoal, are familiar features of these woods.

I have known Aymestrey long enough to remember this phenomenon occurring in almost all parts of these extensive woods. Such woodlands as these are immeasurably more picturesque than the formal coverts and plantations of the modern improver, and lead ones thoughts back to the time when these hills were clad with veritable forests, of which the present woods are doubtless the descendants and counterparts. Among the rarer trees may be noticed the wild Guelder rose *(Viburnum Opulus)* whose flat corymbs of white blossoms at this season, and of brilliant red berries in the winter make it one of the greatest ornaments of the place; it thrives especially by the river-side, and on the edges of the larger woods. I have often wondered why we do not find here the Bird Cherry, which thrives so well in similar situations in Wales.

The common Wild Cherry *(Prunus cerasus)* abounds here, especially in the wood to the east of the village. Its white blossoms in spring and its glowing hues in autumn are very conspicuous. Privet occurs at the bottom of Grayley Wood, but perhaps it is not really wild. The Spindletree is common.

The largest Willow I know, overhangs the river in the meadow behind Yatton Court.

There is a fine Aspen *(Populus tremula)* overhanging the lane that goes up the hill past the lime-kiln, starting from the turnpike. At the top of that lane, just where the road turns round the head of a picturesque combe, as we should call it in Somerset, there is a very fine Beech tree, the growth of which has something of the horizontal character of the Cedar. There was formerly a very fine Beech near the turnpike at Mortimer's Cross; but this tree was blown down last winter. It was 16 feet in girth. Common Poplars are not unfrequent in the valleys.

Mistletoe abounds here, not only in the orchards, but on other trees. There are several bunches in the tall Limes near the turn to the mill. There are one or two in a Mountain Ash on the lawn at Yatton Court. And greatest rarity of all, the Mistletoe-oak of Deerfold Forest is within the boundary of Aymestrey parish.

Ornamental trees grow to a great size here. The variegated Hollies, which, alternate with the Yews in the walk by the river-side close below Aymestrey bridge, are of great size. They are doubtless a relic of the garden of the old Yatton Court, which preceded the present mansion. The Limes close by, and the Elms in the avenue, are also very fine: but the noble Elms which used to ornament the valley below the village have most of them fallen. Some of these were of unusual height, as is so very often the case in narrow valleys.

Old trees will, I fear, soon be as scarce as old churches. The rage for improvement, so-called, threatens to sweep away many of the most picturesque features of our country. The trees that overhung our roads are most of them

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tone. If a new plantation is made, it is in nine cases out of ten composed of Larch, stiff, mononotous, wiry-looking trees, which cannot compensate by their fresh verdure during the short month of spring for their dreary meagreness through the rest of the year. If ornamental trees are wanted in grounds about a house, then one sees nothing but Conifers, beautiful enough in themselves, still more so in contrast with deciduous trees, but gloomy in colour, monotonous in outline, and fatal to all undergrowth.

I find that Mr. Purchas in his summary enumerates 464 species of plants as occurring in the district of Aymestrey. I suspect that by far the greater part of that number may be found in the parish of Aymestrey alone. I have by me an old list of those which I have myself observed, abounding, as I am sure it does, with oversights and omissions, and yet reaching a very considerable number.

This is the very paradise of ferns. Ferns that love shade and damp; ferns that love old stumps of trees; ferns that love crumbling rocks; ferns that love stony banks, can all find here localities to suit their taste. Out of 26 species of ferns enumerated by Mr. Purchas, 21 are said to occur in the Aymestrey district. Of the 5 omitted, I think I may boldly claim one, *(Lastrea dilatata)*, as an inhabitant of our woods. It occurs, if I am not mistaken, in large quantities at the bottom of the steep wood on the right of the valley coming down from Lyepole to Aymestrey. On the other hand I am bound to confess that I never found one which does occur in another part of the Aymestrey district, viz., *Cystopteris fragilis*. I have also found here the club moss *(Lycopodium clavatum)*, but it is long ago, and I have since looked for it in vain. The oak and the beech ferns, *(Polypodium Dryopteris* and *P. Phegopteris)*, grow here in great abundance, but are not very easy to find. They occur on the north side of Shobdon Hill, and on the north side of the wooded hill near Aymestrey village beyond the great quarry. The beech fern is the more abundant of the two. They grow under the oak coppice wood, amongst dead leaves and loose stones, in a dark shady spot where no sunshine can ever reach them. They come up later in the woods than when cultivated in the garden, and are cut by the first frosts of autumn, so that their career of beauty is but short. Another fern very common here, though somewhat rare in most places, is *Blechnum boreale*. It thrives in very different situations; in the damp shady spots where the Oak and Beech Ferns flourish, and in Grayley Wood, where it is exposed to full south sun, and sheltered from every biting wind. Its glossy barren fronds are much more numerous than the thin wiry fertile ones.

Returning to the same place at intervals for many years, as I have done to Aymestrey, one comes to greet certain plants like the well-remembered faces of old friends; and so if I particularize any of them, I may run the risk of mistaking my own favourites for objects of general interest. Pardon me if I do so. Let me begin with one that I think is really remarkable, and that is *Galeopsis versicolor*. Few wild flowers are so showy: its gaily contrasted tints

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seem like those of some florist's pet. I have found it by hedgerows near Yatton. Year after year I greet the tiny yellowish blossoms and hard shiny seeds of Gromwell *(Lithospermum officinale)*. The plants are always to be found in the same spot, but do not increase either in size or in number. Snowdrops appear every year in considerable numbers. They grow amongst the roots of the Alders near the ford below the village; and are thoroughly established there, if not really wild.

The small, white flowering Teazle (*Dipsacus pilosus*), armed with bristles instead of hooks, occurs in two small patches near the village. The Moschatel (*Adoxa moschatellina*) thickly covers the ground in small patches under trees in early spring. The Musk Mallow *(Malva moschata)*, abounds here. The beautiful Wood vetch *(V. sylvatica)* covers the lower trees in some spots. Some of the woods are full of Whortleberries, or Whimberries as they are here called, but they do not bear much fruit. The only heath here is the Common Ling, which is very abundant. The pretty creeping plants, *Lysimachia nemorum*, *L. Nummularia*, and *Hypericum humifusum*, are abundant, especially the first.

That beautiful plant *Allium ursinum*, so attractive to the eye and so repulsive in other ways, fills the lower part of the wood on the right bank of the river near Lye Pole with its powerful smell and clusters of white starry flowers.

The Comfrey, so ornamental on the river side and in shallow water, may be found abundantly near Aymestrey-bridge and mill. *Polygonum bistorta* grows plentifully in one patch in the meadow behind Yatton Court. The large blue Geranium occurs in some shady spots on the edges of woods.

There is one inhabitant of these woods which I have not mentioned yet, less innocent, or at any rate less innocuous, than those we have been considering. Adders abound; at any rate, so I have been assured, but I must confess that I have seen very few either dead or alive. Blindworms are more frequent.

But it is time to conclude these notes and reminiscences. I will only say that if it be true (as Kingsley, I think, has somewhere said) that the best naturalist is the man who knows thoroughly the natural history of a single parish, I cannot imagine any better field for study than Aymestrey. A man who knew thoroughly what is to be known about this parish, would know more than most of his neighbours. He would have before him objects of unusual variety and interest; and may without much difficulty make Aymestrey as much a household word as Selborne has long been.

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The Woolhope Naturalists' Field Club.

ROSS, THE WYE, AND SYMOND'S YAT MEETING.

TUESDAY, JUNE 21, 1870.

"How oft
In darkness and amid the many shapes
Of joyless daylight; when the fretful stir
Unprofitable, and the fever of the world
Have hung upon the beatings of my heart—
How oft, in spirit, have I turned to thee,
O sylvan Wye! Thou wanderer thro' the woods!
How often has my spirit turned to thee!"

Wordsworth.

The characteristic features of the Wye scenery are familiar as household words. The river Wye has been described again and again from its rise on bleak Plinlimmon to the junction of its pure waters with those of the muddy Severn. Who does not know the wild desolation of its source—the beauty of the rocky channel it has made for itself through the mountains of South Wales—its rich passage through the well-wooded vales, the green pastures, and the blooming orchards of Herefordshire—and the picturesque grandeur of its Monmouthshire and Gloucestershire shores? As the elements of physical beauty increase with the progress of the river, so too do the objects on its banks become increasingly rich in interest and in historical associations. The small castles of Builth, of Hay, and of Clifford, prepare for those of Wilton, of Goodrich, and of Chepstow; and so too do the many village churches and spires lead on to the Cathedral at Hereford, and the noble ruin of Tintern Abbey. Throughout the course of the river the interest is ever varied and ever on the increase, and it is this which makes its charm so perfect. Poetry in description or poetry in art must ever fail to represent fully such lovely scenery.

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It must be seen and felt to be enjoyed and understood, and with all the varying changes of light and shade, of season and the atmosphere, of its own conditions, and in the incidents of the hour, the oftener it is visited the more freely will its richness be esteemed and the more fully will its great beauty be appreciated.

The fashionable "Tour of the Wye" begins at Ross, and the Woolhope Club invited the ladies this year to take the excursion in the orthodox manner. Precise and careful arrangements had been made. They were most satisfactorily carried out, and those ladies who braved the almost tropical sun spent a very enjoyable day, and found afterwards how very much less they had felt the heat than those had who remained at home.

The ivy-clad ruins of Wilton Castle look so well from the river, and are always passed by so unceremoniously, that one is apt to fancy them mere artificial ornaments to the scenery. Wilton Castle is a reality, however, and no sham, and at this time it gives a title to an earldom. Leland says King Stephen built it 729 years ago (1141), to protect the ford possibly, or as a check to the troublesome Welsh. History tells not, however, of any warlike deeds at the Castle. For many centuries it belonged to the De Greys, its most noted possessor being Sir Wm. Grey, the 13th Baron, "the greatest soldier of the nobility," as was said of him. He was Governor of the Castle of Guisnes, in Normandy, when it was attacked by the French. After a gallant defence he was compelled to surrender to the Duke of Guise, and had afterwards to pay the heavy ransom of 20,000 crowns for his liberty. His son Lord Arthur Grey, was a good soldier too, and he employed as his secretary Spenser the poet. The Fairy Queen was written when in his service, and Spenser calls him

"Most noble Lord, the pillar of my life
And patron of my Muse's pupillage."

Wilton Castle passed into the family of the Brydges in Queen Elizabeth's reign. It had become, however, by this time a castellated mansion, "not a castle-like but a house-like building," as Silas Taylor hath it. In the Civil War Sir John Brydges, its then possessor, took a very uncertain, unworthy part, scheming and shuffling, but acting chiefly with the Roundheads. He thus made himself very unpopular, and Wilton Castle was burnt down by those noted royalists, "Henry Lingen of Sutton, and one Barneby Scudamore" at that time "entrusted with ye government of ye city of Hereford." (Silas Taylor.) The Brydges, Barons of Chandos, held possession for many years, when Sir James Brydges, the "Timon" of Pope's Satire, and the "Princely Chandos" of popular repute, became Marquis of Carnarvon and Duke of Chandos. In 1723, in consequence of some political pique, the Duke sold Wilton Castle and all his Herefordshire estates to Mr. Thomas Guy. They were left by Mr. Guy in trust for the noble Hospital he founded in London, "Guy's Hospital," and thus are they now held.

As boat after boat, gaily, laden with fair philosophers, passed under Wilton Bridge, its castle was forgotten in the exciting question whether there was water enough to carry them safely over the shallows below. The result was

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satisfactory, for beyond the occasional grating of a pebble there was nothing to try the nerves of the visitors, and they were left calmly to enjoy the beauty of the river, the clear brightness of its water, and the large masses of the great white water ranunculus, *R. fluitans*, peculiar to the river Wye and some few other rapid rivers. Beautiful clusters of the Forget-me-not, *Myosotis palustris*, were plentifully scattered along the banks, and upon one of them, an entomologist present observed a fine specimen of the *Lesia formicæformis* sipping the nectar from its lovely blossoms.

For the first three miles the river wanders through a level plain, draining a pre-historic lake. Its ancient bed of varied stones and pebbles with here and there a large boulder, was plainly visible in many places, covered by some 8 or 10 feet of alluvial soil.

There was a pleasant breeze upon the water, but a clear proof of the sun's heat on shore, and the activity of the flies, was afforded by the different herds of cattle bathing themselves in the cool water. How pretty and picturesque they looked; and Vaga, as if proud of her own special breed of cattle, reflected their colours in deeper and brighter tints than their own. Why should not some of the agricultural members draw up for the Club an account of the origin and history of the Herefords? It would form a paper of practical zoology of very great interest, and surely material for it would be forthcoming if asked for.

A stranger was observed here upon the river:—

"The *Water-lily* to the light
Her chalice rears of silver bright."

There was but a single blossom of this Queen of British flowers, *Nymphæa alba*, floating on the water—and of course the tuberous root had been carefully planted there, but it must be right well pegged down if it can resist long the force of the river currents, in its boisterous moods.

The fine woods of Peneraig were soon reached and the turrets of Goodrich Court, which some people admire, gave place to the noble ruins of Goodrich Castle standing well above the trees forming such a beautiful object from the river. "This view" says Gilpin with all the dogmatism of art, "is one of the grandest on the river, I could not scruple to call it *correctly picturesque*, which is seldom the character of a purely natural scene."

Here the boats as they successively arrived drew to the shore, and their occupants—with an hour's grace—strolled pleasantly up to the castle and inspected the ruins under the guidance of Dr. Bull, the president for the day, who pointed out to them the most remarkable features of the fortress, its square formation, the large round towers at the angles, the square Norman Keep on its western side, the great thickness and strength of its walls, the moat on the land side hewn out of the solid rock (supplying the stone for the walls), the entrance at the eastern angle between two towers, narrow, long, and dark, protected by a drawbridge and pit beneath it, with portcullis after portcullis, loopholes at the sides, and machiolations or holes in the vaulted roof above, for pouring down red-hot sand, or melted lead upon the heads of any intruders who might

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be able to get thus far. The several rooms and offices within were next pointed out, the chapel, the garrison tower, the offices, the prison, the fine hall, 65 feet long by 28 broad, the ladies room, &c., &c., and then, at the request of some of the ladies who wished to hear something of its history Dr. Bull gave a

BRIEF SKETCH OF THE HISTORY OF GOODRICH CASTLE.

Ladies and Gentlemen: Whenever we want to know the history of any old castle we may meet with in this county, we are now fortunately able to find a good account of it in that excellent book "The Castles of Herefordshire and their Lords," by the Rev. C. J. Robinson. Finding last night that the lead to-day would fall upon me I read his account of Goodrich Castle and one or two other books, and am therefore able to tell you something about it.

There is nothing known of the history of the castle before the Norman conquest. The name of Godricus dux is attached to two charters of King Canute and from him the village and castle is supposed to derive the name Goodrich. Doomsday-book says, "Godric Mappesone holds Hulla" meaning probably Howle Hill, in the parish of Walford, just over the river, upon which hill there are still some traces of fortification.

Doomesday book makes no mention of Goodrich Castle, which is accounted for by the statement that the survey was very incomplete here, owing to the district of Archenfield having been recently laid waste by the Welsh under the leaders Griffin and Blein. There can be little doubt but that the present castle was built to stop the incursions of the Welsh, though the actual builder is not known.

A century after the conquest (1165) it is known to have been in possession of William Marshall, Earl of Pembroke, and he was confirmed in his possession by King John in 1203. Earl William was a true Royalist, as bold in the field as he was able in council. He defended the insurgent Barons at Lincoln, and laid siege against London in the king's behalf, and was afterwards made guardian to the young prince, Henry IV. His five sons all succeeded to the earldom, but were by no means all loyal. The castle was forfeited to the crown, and was granted by Henry III. (1247) to William de Valence.

It descended through a niece to the next great man who held possession of it, Richard Talbot, the 2nd Baron, who was summoned to Parliament as Richard Talbot of Gooderich Castle from 1331 to 1335. He is thought to have improved very much the internal arrangements of the castle, by means of the ransoms obtained from prisoners captured in foreign wars. Edward III. allowed him, by special licence, to build a prison for malefactors in the field below the castle, the ruins of which we have just passed by. He also founded the adjoining Priory of Flanesford about the year 1347.

Another man of mark among the possessors of Goodrich Castle was Sir John Talbot, the 1st Earl of Shrewsbury, grandson of Richard. He was renowned for his martial achievements. The hero of forty battles, foremost in the brilliant though profitless campaigns of Henry V. and VI., he yet survived

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to the advanced age of eighty, and was slain after all sword in hand at the battle of Châtillon in 1453. His son joined the Lancastrians, and was slain at Northampton in 1460. The castle was then forfeited to the Crown, and granted by Edward IV. to the zealous Yorkist, William Herbert, Earl of Pembroke. John, the 3rd Earl of Shrewsbury, made peace with the King, and got the castle and estates restored, but it ceased to be the principal seat of residence, and on the death of the 7th Earl, it went by marriage to Henry Grey, Earl of Kent.

Thirty years afterwards the most interesting event in its history took place—

THE SIEGE OF GOODRICH CASTLE DURING THE CIVIL WAR.

The fortress had at first been held by the Parliamentrians—when Col. Kirle was the Governor under Lord Stamford, and when it was the centre from which the Roundheads made many forays—but somehow or other in 1646 that staunch Royalist, Sir Henry Lingen, was Governor. He had with him Lieut.-Col. Roger Lingen, Mr. Ralph Lingen, and many other gentlemen of the county, of the families of Pye, Bodenham, Lochard, Cornwall, Vaughan, Skipper, Wigmore, Hill, Strete, &c., and a strong garrison. The castle was well provisioned moreover for a siege.

All this was well known, and it was arranged to make a sudden attack on Goodrich Castle with all the disposeable parliamentary forces in the neighbourhood. On March 10th, 1646, Colonel Birch drew out a party of horse and foot from Hereford, and, joining Colonel Kirle's horse and dragoons from Monmouth, with Captain Rumsey's firelocks, they commenced the attack. The stables fell into their hands at once. They took 64 horses, with the hay and other provisions therein, burnt down the building, and laid close siege to the castle. This account is from a newspaper of the period called the *Perfect Diurnal* from March 16th to the 23rd, 1646. This newspaper, and another called *Perfect Occurrences*, give very interesting notices with reference to the siege. The following passages are taken from them under the dates attached :—

June 5th, 1646.—"Col. Birch begs the committee to let him have some battering pieces for Gutheridge, 'else,' he says, 'I may sit down long enough before it, Lingen being an excepted person, and one unto whom I cannot grant any honourable terms.'"

June 12th.—"Letters from Hereford dated June 1st advertise of Col. Birch being before Gutheridge with a considerable body of horse and foot, and two mortar pieces and other equipage. The great iron culverin was going from Gloucester thither, and Col. Birch hath sent to the committee of Salop for two guns from Ludlow, yet the enemy within are very resolute and not lavish in their ammunition. . . . Lieut.-Col. Keckerman hath received a wound by an almost spent bullet from a musket in his leg, and intends to be removed to Hereford to be cured."

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June 22nd, 1646.—"From the leaguer before Gutheridge Castle, letters advertise us that the enemy within are very resolute, if not desperate. A summons was sent in June 13th with abundance of fair and pressing arguments, but the return was a flat denial and confident expectation of relief before they needed it, which occasioned Col. Birch never to parley more, and he thereupon sent them in six granadoes and tore down a piece of one of their towerr. They seem yet fearless but sparing of their ammunition which we hear to be not much; and yet they made a sally out and killed us seven and hurt ten, and we have hurt as many of theirs. Their hearts are stable and their walls strong and high—nothing but extremity will force them."

Then comes the following interesting letter of Colonel Birch to the Speaker of the House of Commons:—

"Sir—Since my coming before this castle I have used all means tending to the speedy reduction thereof, and am approached upon all sides so near that they annoy me with throwing of stones. I find the thing in itself very strong, and the defendants (being excepted persons and papists) very desperate. They have made many sallies, insomuch that they have lost at several times 100 horses, and now have not above 5 remaining. They have not killed me above 24 men in all, and never took one prisonsr, though at divers times we have been at hand blows. And I find that my batteries, mortar pieces, and mining, being the three ways we now put in execution, having cast a mortar piece here which carries a shell of 200lbs. weight; I shall spend more powder than is here to be had, and for want of which I shall not be able to go on, if not supplied. My humble request, therefore, to the Parliament is for 80 barrels of powder for the service of this place and county, the magazine at Hereford being very small, with which assistance I question not to give you a timely account of this castle, and to approve myself

Your humble servant,

"From Gutheridge, June 18th, 1646." JONH BIRCH."

June 25th.—"One of the cavaliers called out to our pioneers at work in the mines, and said they cared not for being blown up; they could, from the sky, laugh at the flourishing of the Roundheads."

July 6th.—"Col. Birch goes on well against Gutheridge Castle and is like to carry it suddenly."

July 15th.—"The enemy is very obstinate. We have supplies of shells for our granadoes from the Forest of Dean. Our ordnance are small and have done but little execution as yet. Our mines go on well; they are now very quiet within, yet will not yield."

July 18th.—"We are in very good forwardness with our mine, and hope very shortly to see the effect of it. Our guns have made a breach in the upper part of the wall, and the granadoes have done them much spoil in the castle; yet they take no more notice of it than if no enemy were before it, acting little against us; only now and then firing off their muskets."

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On the 31st of July the mine evidently was ready for explosion, as they must have known within the castle from the progress of the work, as well as from the movements of the besiegers. Col. Birch was bringing up all his men in close array ready to storm the breach it was hoped the mine would effect, when a white ensign was hung out. The result of the parley, which was at first refused, was the immediate surrender of the castle on the simple condition of the lives of all the garrison being spared. A hundred and four men marched out as prisoners, viz., 43 gentlemen, 1 priest, and 60 common soldiers. The stores in the castle were found to consist of two hammer pieces, four barrels of powder, a good proportion of match and bullet, 120 arms fixt and unfixt, 30 barrels of beer, one standard culler (whatever that may mean), great stores of corn and meal, 60 flitches of bacon, 150 bushels of peas, one hogshead of claret wine, half a hogshead of sack, and good store of butter, cheese, and beef.

The surrender of the castle is generally attributed to want of ammunition, or scarcity of food. It was probably due to neither of these causes, certainly not to the last. During the five months the siege lasted the royal cause had become hopelessly lost in the hearts of the people, and to have held out longer would have served no good purpose, whilst it would undoubtedly have caused great loss of life.

On the 25th of August Parliament ordered Mr. Brown and Mr. Selden to acquaint the Countess of Kent of the necessity for demolishing the castle. This lady does not seem to have paid much heed to the notice, for in the following spring it was again ordered "that Gutheridge be slighted," and slighted it was, by means of the mine very possibly from which the powder had been removed the previous summer.

The ruins continued in the possession of the Grey family until the death of the Duke of Kent in 1740, when Vice-Admiral Griffin bought them; and his grand-daughter, Mrs. Marriott, is still the possessor. The castle now gives the title of Viscount to the senior representative of the family of the present Earl de Grey and Ripon.

Dr. Bull pointed out how useless the invention of gunpowder had rendered the elaborate fortifications of the entrance gate, for Col. Birch had planted his guns and made his attack on the north side of the castle, and it was that side which was now in the most ruinous state.

The visitors then wandered over the old rooms, and many of them ascended the keep for the extensive views it afforded, gathering wild roses from the very summit as memorials of the day.

The magnificent Ash tree, which grows in the centre of the ruins, received due admiration. It is indeed a fine tree. Its circumference, at five feet from the ground, being 12 ft. 1 in., and it carries its stem up to a considerable height. The Wych Elms, and especially a small leaved Lime tree, on the Castle-hill, also attracted attention.

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Some fresh arrivals were greeted at the Ferry, and the boats were again taken for the descent of the river. A canoe, well and cleverly handled, was in attendance, and as the string of boats followed each other round the curves of the river the effect was exceedingly pretty; the gay dresses of the ladies, the sound of cheerful voices, and the splashing of the oars, gave life and animation to the natural beauty of the river.

As true chroniclers of the proceedings, it behoves us to state that small baskets made their appearance from secret places about this time, greatly to the satisfaction of the travellers,—

"For all must know romantic scenes will clog,
Without the aid of perishable prog."

There was one boat casualty in the day's experience. A small boat rather heavily laden had passed Goodrich Castle without stopping and got well ahead, but on one of the rapids it took too short a cut, got aground, and had the mortification to be passed by every boat in the long string, before it could get afloat again.

The views of Goodrich are not so fine to look back upon, but the Gothic windows of Flanesford Priory, now a barn, made some of the antiquarians anxious to visit them. It might not be, for the journey was long, and the river scenery the grand object of the day.

The lights and shadows on the hills were very fine as they closed in more upon the river and became more steep. Now a dash of crimson was thrown in as the sun shone over a field of poppies, and now the smoke from a half-hidden cottage or a limekiln added picturesque features to the landscape. A flock of lapwings flew round the boats at one place, uttering the sweet musical notes of the young birds, and here and there the leading boat caught the bright blue flash of colour on the water from the kingfisher as he flew straight out of sight.

About a mile below Kerne bridge a stoppage was made to visit the tunnel for the railway now in course of construction between Ross and Monmouth. It passes through the Coppet Wood Hill, and by the politeness of G. E. W. Wellesley, Esq., a man had been sent down to open it for any ladies or gentlemen who might wish to visit it. The navvy appeared in due course and costume, with a bundle of candles, and lighted one for every visitor who entered. Many did so, and found themselves in a passage boarded up on all sides dark, and damp, and cold. At first the candles only made its darkness the more intense, but by degrees as the eye accommodated itself to the gloom, a hunt for funguses began. Several Polypores were quickly found growing on the timber and boarding, a very pretty Mycena, and a fragile Coprinus, too delicate to exist long enough in the dry air outside for their exact names to be determined. From the boards forming the roof curious moss-like masses of Mycelium hung down. It was too dangerous to remain long, and the boats were soon regained in the warm air outside.

The beautiful course of the river by Bishopswood, Ruardean, and Lidbrook, were then pleasantly passed, when a bend in the river brings very prominently

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into view the new stone parsonage of Welsh Bicknor, and its pretty little church, and a stoppage was made to visit them.

The church has been entirely rebuilt, but without staying to notice its details, often rich and elaborate, it may be said that due regard has been paid to its great antiquarian treasure, the recumbent female effigy, said to be the Countess of Salisbury who nursed Henry V. at the neighbouring mansion of Courtfield. It is without date or inscription but from its costume, which is graceful, Sir Samuel Rush Meyrick thought it a century older than this date, that is he referred it to the time of Edward I. It might perchance represent that Countess of Salisbury whose son, Sir John Montacute, succeeded to the earldom, and became also Earl Marshall of England. He is remarkable for having embraced the Lollard doctrines at a very early period, and was one of the first to suffer martyrdom, for he was murdered by the populace of Cirencester in the year 1400. A Lady Montacute is however said to have been the real nurse of Henry V.

The parsonage is prettier to look from, than to look at. But those who cared not for its architecture could scarcely fail to be charmed with its site for the view back up the river, upon Lidbrook, is very fine. The botanists too found here the beautiful flowering rush, *Butomus umbellatus*, in blossom, and the round-leaved mint, *Mentha rotundifolia*, growing freely but not yet in flower.

The river here separates Welsh Bicknor in Monmouthshire—formerly Wales—from English Bicknor in Gloucestershire, and therefore it used here to divide Wales from England.

"Inde vagos Vaga Cambrenses, hinc respicit Anglos,"

as Neckham says, which may be translated—

"Here Wye the wandering Welsh, and there the English sees."

This Neckham, by the way, was one of the earliest of Vaga's poets. His real name was Alexander Nequam. He was an Englishman, who was educated at Paris, and became a monk of the order of St. Augustine. He applied to be admitted as a resident in the Abbey of St. Albans. The jolly old Abbot, seeing the signature "Nequam" (a word in Latin meaning "worthless"), chuckled within himself, and sent him this answer—

"Si bonus sis, venias, si nequam, nequaquam,"

which, for the benefit of the ladies, may be thus given in English, though the pun is lost by it, and its brevity too—

"If you're good for anything, yea, you may;
But if good for nothing, stay away."

If the pun was irresistible to the old Abbot, it secured the admission of the student, and it was effective too, for it made him change his name forthwith to "Neckham," without a *Times'* advertisement. Neckham afterwards became Abbot of Cirencester, and died there in 1217. His chief work was a Latin poem, "De Laude Sapientiæ Divinæ."

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At this time, when seated under the fine growing yew tree in the churchyard of Welsh Bicknor (8 feet 7 inches in circumference), the sky became partially overcast and the air felt close. The flies were troublesome, and the summer knats or midges danced actively about—

> "Thick in yon stream of light a thousand ways,
> Upwards and downwards, thwarting and convolved."

It seemed to threaten a thunderstorm. However, it was but a passing gloom, for the sun came out again before the boats were reached, and all was bright and cheerful.

And now the procession of boats again began. The scenery was very fine and engrossed all attention. The river winds very beautifully, and as its course was followed the hills seemed to change their places, and one steep finely wooded hill in particular called "Rosemary Topping" was very changeable. At first to the left side, it then took a position in full front, and lastly as it was passed on the right bank, the Coldwell hill with its fine rocky scenery came gradually into view. The sun shone brilliantly, and whilst the large masses of rock which stand prominently forward were in shade, the tops of the trees in the recesses on either side were in full light, and as the lights and shadows varied with every stroke of the oars the different effects produced were admirable, and all felt that the boats arrived only too quickly beneath that

> "Tower of rock that seems to say
> Go round about me neighbour Wye."

A landing was effected near the entrance to the tunnel beginning to be made through the shoulder of Symond's Yat—a short scramble, but a steep one, through the underwood and hazle bushes brought the fair naturalists to the regular path which ascends the hill obliquely to the foot of the rocks. The road was in shade, the views from it were fine, and plants of rarity grew on every side. The fronds of the Harts-tongue fern, *Scolopendrium vulgare*, were seized at once, the prickly shield ferns, *Polystichum angulare* and *P. aculeatum*, and the sweet maiden hair *Asplenium Adiantum nigrum* and the Polypody *Polypodium vulgare* were very abundant, and one or two gentlemen gathered from secluded crannies of the rocks the brittle fern *Cystopteris fragilis*, and amongst the underwood beneath, the fern of the district, the Limestone Polypody, *Polypodium calcareum*, and the sword-leaved Helleborine, *Cephalanthera ensifolia*. The ladies kept to the path, gathering the elegant nodding Wood Melic grass, *Melica uniflora*, the yellow Cow-wheat, *Melampyrum pratense* the wild Cornel or Dogwood, *Cornus sanguinea*, in full flower, and noticing the shrub, with broad leaves white and cottony beneath, the White-beam, *Pyrus aria*, which is one of the specialities of the place.

Meanwhile the little urchins of the district had become aware of the visitors, and catching quickly the prevailing scientific air, rushed off and brought some very beautiful botanical specimens, the Bee Orchis, *Orchis apifera*. They were in the perfection of blossom. The very bee itself seemed there

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sucking the honey from the pale purple petals, but it did not move ;

"Perhaps his fragrant load may bind
His limbs ! we'll set the captive free !
I saught the living bee to find,
And found, the picture of a bee."

Twopence each for plant and flower altogether was reasonable enough, and the private stores in the cottage gardens were quickly lessened. The supply, however, exceeded the demand, and long may it continue to be so.

The district of Symonds Yat is noted for its botanical treasures. Besides those plants already named its woods are varied with Yew, the small-leaved Lime tree, Oak, Beech, Wych Elms, Hawthorn, Grey Poplar, Maple, Spindle tree, Crab, Gueldar rose, Holly, Buckthorn, &c., and it is this variety which adds so great a charm to the scenery in Autumn, when all the varied tints are so conspicuously shown.

That excellent practical botanist, Mr. B. M. Watkins, met the Club here and brought with him some other of its choice plants, as the Fly Orchis, *Orchis muscifera*, and the green-leaved Houndstongue, *Cynoglossum sylvaticum*. This is a very rare and local plant, but the common Houndstongue, *C. officinale*, is common enough. As there is a use connected with it which is not so well known, we give the receipt :—

To drive away rats and mice.—Gather the Houndstongue in full vigour of growth ; bruise the plant with a hammer, and lay it in places frequented by rats or mice and they will forsake the premises.

So says M. Boreux, and we can well believe him, for the plant has a horrid smell, and the animals have nicety and sense.

The last portion of the ascent to the summit of the Yat was rather trying to the ladies. It was in the full blaze of the sun, and steep, and the top itself half baked. It was, however, surmounted by degrees, and here, seated on convenient inequalities, or reclining at length, under the protection of umbrellas, the company listened to "The Address on Geology," by Dr. Wright, of Cheltenham. It was very eloquently given, and listened to with much pleasure ; indeed, it is no light compliment to say what was the fact, that under such warm circumstances it made fifty minutes seem to be only twenty. For the present the summary of this lecture, as contained in the lines of old Chaucer, need only be given—

"He hath so well beset His ordinance
That species of thinges and progressions
Shullen enduren by successions
And not eterne, withouten any lie."

Great applause was given at the conclusion, and Dr. Wright then led the company to see a fine boulder, upon which he again spoke eloquently. During the delivery of the address a specimen of *Agrotis lucernea* was observed careering wildly as is its wont, and in security, around the summit of Symond's Yat ; and ever and anon the hills reverberated with the explosions made in the limestone quarries on the Great Doward hill.

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After spending some little time in the beautiful walks on the Coldwell rocks it was time to think of the descent. At the foot of the promontory of Symond's Yat is situated the New Weir, the site of the once famous forge and ironworks. These works were built in the year 1680 by Mr. George White (an ancestor of one of the members of the Central Committee) and an extensive trade was carricd on there throughout the eighteenth century. A weir across the river supplied the horse power, and the coppice wood of Herefordshire furnished the charcoal. It is on record that Mr. White was an extensive purchaser of wood from the Scudamores of Kentchurch.

The weir was a somewhat formidable obstruction both to ascending fish and navigation, until a lock was made for boats on the one side and an opening in the centre for the passage of salmon.

Mr. Partridge, of Bishopswood, succeeded Mr. White as lessee under Admiral Griffin, who had purchased the property, as well as the manor and castle of Gooderich, as has been mentioned to-day, from the Duke of Kent. In his time and during Mr. White's occupation the salmon fishery below this weir was very valuable, and formed no inconsiderable part of the profits of the forge. With the general decay of forges alluded to in our Club's transactions, which arose from their being situated at a distance from the minerals, or from being inconvenient of access, New Weir Forge similarly became of less value. In 1797 Ireland, in his book on the Wye, describes it as still in full work, and he gives a picture of the lock, weir, and ironworks. He appears to have been much impressed with the grandeur of the scene, in which the fall of the waters over the weir, the awful sound of the iron hammers beating out the fiery mass, the immense volumes of sparkling smoke issuing from the forges formed the component parts.

In 1814, on the breaking up of the ice, the weir was partially demolished, and has never been rebuilt. All that now can be seen on the site of one of the most famous of the Herefordshire Forges is a somewhat unusually rapid stream, and an island on the right bank planted with larch trees.

It was very warm going down the steep hill to the Washings Ferry, and the way seemed long, though when the lane was left it was very pretty as the path led down under some magnificent strata of the Old Red Sandstone Conglomerate. The ferry boat is managed by rope as in the 14th century. It was safely crossed, and a ride somewhat long and dusty brought all the visitors to the Royal Hotel.

The dinner took place at six o'clock. Immediately afterwards Dr. BULL, who was in the chair, rose and said that the President of the Club for the year, the Rev. Mr. Key, was very sorry to be prevented from attending that day to welcome the ladies who had done the Club the honour to attend this meeting, neither had either of the Vice-Presidents been able to be present, and thus the duty of taking the lead had fallen upon himself as the next officer of the Club. Happily there had not been any difficulty about it, for the arrangements had been so carefully made, the day had been so favourable, and the scenery they

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had passed through so very beautiful, that he thought they must all have spent as pleasant a day as he had done (applause). There were some few matters of business to which he must allude before the papers for the evening were read. He was sure they would wish him, in the first place, to give their thanks to Mr. Henry Southall, for the trouble he had so kindly taken to make the arrangements, which had been so satisfactorily carried out. He had done much more than this, for, finding that there might be a scarcity of papers, he had prepared one himself on the Meteorology of Herefordshire, which would be of great interest and value to the Club (applause). They were also exceedingly indebted to Mrs. Southall for the bouquets—the very elegant bouquets he ought to say—which had been prepared for the ladies (great applause). This was one of those delicate attentions which did so much towards passing off their meetings so pleasantly and satisfactorily as they always did go off at Ross. He ought to call their attention to the fact that each bouquet not only had a spray of the maiden hair fern, but also a small frond of the fern of the district, the Limestone Polypody (applause). The ladies might also have the satisfaction of carrying off with them a root of this somewhat rare fern to plant in memory of the day, for Mr. Southall, with the assistance of Mr. Watkins, had procured a whole tray full for this purpose (applause). Dr. Bull then said he had to tell them of a very generous gift made to the Club by Mr. Rankin, who was president last year. He had presented them with the entire cost of Mr. Worthington Smith's "Key to British Agarics" and all its illustrations, that the funds of the Club might be devoted to the publication of the Flora (great applause). The next information he had to give them was that the following gentlemen had been unanimously elected members at the meeting in the morning:—The Right Hon. Lord Bateman, the Rev. F. T. Havergal, Herbert Howarth Wood, Esq., and the Rev. Arthur Edward Evans; and some other gentlemen were then proposed for election. Dr. Bull then concluded by paying a high compliment to the lecturer of the day, Dr. Wright, of Cheltenham, who had been so kind as to come and give them the very eloquent address they had had the gratification of listening to on Symond's Yat. He was very sure he was only conveying the sense of all the ladies and gentlemen present in thanking him very cordially for the very able lecture he had given (great applause).

Some magnificent specimens of a new silkworm from North America, *Platysamia Cecropia*, which may possibly become useful, were then sent round for the inspection of the company. They were brought by Dr. Chapman, of Abergavenny, who had exhibited the larvæ at one of our meetings last year. Dr. Chapman had also brought with him some very fine specimens of *Lentinus Lepideus*, the new fungus he had discovered last year at Abergavenny.

Dr. Wright, in returning thanks for the kind manner in which they had received him, was good enough to give them an interesting sketch of the discoveries he had made with reference to the "Coral Beds of the Oolite Rocks."

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A beautiful collection of British butterflies and moths was exhibited during the evening by Alfred Purchas, Esq., and was much admired.

The roots of the *Polypodium calcareum* were then distributed to the ladies, and all had to start for the trains. Thus a long evening proved almost too short, and another day spent by the Woolhope Club at Ross has passed into history with pleasant and spirited recollections.

The following papers were read at the meeting:—

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ON THE GEOLOGICAL FEATURES OF THE LANDSCAPE.

BY THOMAS WRIGHT Esq., M.D., F.R.S.E., F.G.S.

Dr. Wright said that at the request of his friend Dr. Bull he had consented to give a few remarks on the geological features of the panorama in the midst of which they now stood, but in order that his demonstration might be understood by those who were unacquainted with the subject it would be necessary to state some of the elementary truths of geology. First then the earth's crust consists of two great classes of rocks, crystalline or igneous, and aqueous or sedimentary, which are both represented in the landscape around us, for far out in the north you see the Malvern hills and the region of the Woolhope district. The axis or central mass of the Malverns is Syenite, a granitoid crystalline rock of great beauty and variety, and which owes its present condition to heat. The eruption of this Syenite caused the upheaval of the chain of hills of which it now forms the axis.

The sedimentary rocks you have seen to-day as you rowed down the river, and the conglomerate beds of the old Red Sandstone you examined below, have given you a capital lesson of what is meant when we speak of rocks formed of sediments; you can have no better example of a mechanical rock than this, for you see the rounded quartz pebbles which had been rolled about on some ancient beach arranged by aqueous agency and subsequently deposited as you have seen them to-day into great conglomerate beds of rock structure, so that one of the first lessons you learn on this charming spot clearly shows us that fire and water have both done their part in producing the framework of the scene around us.

In order to understand the next part of our story I must tell you that the history of the earth's crust, written upon its own leaves or strata, is divisible into four volumes, each of which contains most valuable teachings of its origin and progress, in the *first volume* are included all the formations between the oldest sedimentary rocks, and those which you see lying before you in the Forest of Dean, and comprising the formations called Primary or Palæozoic rocks or those containing the oldest forms of animal and plant life. The *second volume* includes the Secondary or Mesozoic formations or those containing the middle forms of life, some of the rocks of this period we travelled over to-day between Gloucester and Ross, and others form the Cotteswold hills overlooking the valley of the Severn, or ranging as chalk downs through Wiltshire. The *third*

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volume contains the younger formations called Tertiary, containing the modern forms of life, and on which London is built, the Isle of Wight and Hampshire basins affording ample illustrations of the older divisions of the Tertiary deposits. The *fourth volume* is devoted to the Quaternary or still more modern deposits containing beds of drift sand, gravel, clay, till, &c., that lie strewed over the surface of our valleys, and having the bones of huge mammalia, no longer found in our latitudes, embedded in those deposits, and often huge boulders that have been transported many miles from their original bed to their present resting place. Such, then, are the contents of the four-volumed rock book, every chapter of which is written in characters that the trained mind and practised eye of the geologist can decipher and understand.

Our chief observation to-day from Symond's Yat relates, however, more especially to the first volume of this eventful history, and therefore it is to the Palæozoic formations that I must now direct your attention, although I shall be able to give you lessons out of the fourth volume, not far from the spot whereon we now stand. The Palæozoic rocks include: 1st, the Fundamental, or Lawrentian Gneiss and the Cambrian rocks of Wales; 2nd, the Lower and Upper Silurians, exposed at Backbury Hill and the Malvern Hills; 3rd, the old Red Sandstone, or Devonian, which you see in all its grandeur around you, and divisible into a lower, middle, and upper series. Sections of the upper beds you have already observed in our walk to-day; 4th, the Carboniferous formations, consisting of the Mountain, or Carboniferous Limestone, on which we now stand, and the bold escarpment of which forms the magnificent vertical wall of the celebrated Coldwell rocks, so splendidly wooded, and through which we have wended our way hither; then before you is the Carboniferous formation of the Forest of Dean, with its Coal Measures, and Millstone Grit, and Sandstones, and Shales, lying in a perfect basin, the lips of which are formed of Carboniferous Limestone; and 5th, the Conglomerate Sandstone and Red Marl, representing the Permian Formation.

The Lawrentian and Cambrian rocks are without our present limits, but the Silurian strata are well exposed on the western slope of the Malvern Hills, at Backbury Hill, and in your own classical district of Woolhope from which your Club takes its name; these rocks, therefore, are most interesting to you Woolhopians, and you have done justice to your own country, for I observe in the four splendid volumes of the Transactions of your Club several important papers and communications on these Silurian rocks. The late railway cutting near Malvern through the Wenlock shale has brought to light a beautiful series of Silurian fossils, and demonstrated the richness of the old Silurian beach in the earliest forms of animal life. Those who think that the great Author of Nature was trying "his prentice hand" on the construction of the Silurian fauna, will find to their astonishment that the shores of that ancient sea contained as great a diversity of species, each abounding in as many individuals, and representing structures as beautiful, forms as typical, and an organisation as complicated as those that are found in the

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living types of the same classes in the present day. The Silurian Coral, Crinoid, Starfish, Crustacean, and Mollusc, is as highly organised as the representative forms of the same animals in the seas of our time, and that development through millions of years has added nothing to the perfection of the primitive types of these classes. The Crustacea of this epoch were remarkable for the number of species and genera belonging to the singular extinct family *Trilobitidæ*. A fine collection of this group has been made by Dr. Gindrod, of Malvern, in which we discover that the most delicate spines and appendages, and eyes belonging to these Crustacea are all most marvellously preserved. Not less beautiful, and perhaps still more wonderful, are the singular forms of Crinoids, Starfishes, and Ophiuræ, of the Wenlock Limestone and Ludlow rocks one of the finest specimens yet found of *Illænus Barriensis* turned out of the Woolhope limestone at Woolhope; the remains of *Pterygotus* are found in the Upper Silurian rocks of Hagley Park, Hereford, and Malvern; but time fails me to tell of the many other organisms found in the Silurian rocks of your district.

The Devonian or Old Red Sandstone attains a great development in the hills around us. In yonder Black Mountain of Herefordshire, which rises in the westward distance, as well as in the Vans of Brecon, 2,860 feet, and Carmarthen, 2,600 feet above the sea, we find magnificent sections of the Old Red Sandstone, for the red rocks in this region have a thickness of from 8,000 to 10,000 feet resting below on the Upper Silurian, and capped above by the Carboniferous Limestone. The grand scene before you exhibits in perfection the Physiographical features of the Old Devonian landscape, and shows how atmospheric erosion has dissected away the softer strata and left the harder rocks to form those chains of hills that bound the western, northern, and southern horizon of our present plateau. Fishes of singular forms were the highest organisms of the Devonian seas, and of these many interesting specimens from the Old Red Sandstone of Herefordshire have been collected by members of the Woolhope Club; but it is to the Old Red of Scotland we must go if we desire to study the most singular organisation of the fossil fishes of this period; they were all encased in an external bony armour, and exhibited some of the most remarkable forms of the fishes type. *Pterichthys*, or wing-fish, *Holoptychius*, or wrinkle scaled fish, *Cephalaspis*, or buckler-shielded fish, are all forms of the Old Red period the remains of which have been found in the rocks around you. The corals, mollusca, and crustaceæ of the Devonian rocks are collected only in the limestones of Devonshire, and have no representatives in the strata before us.

The Carboniferous Limestone on which we stand was the sediment of an extensive and wide-spreading sea for all the organisms with which it abounds must have lived in salt water. In the Great Doward Hill before you capital sections of the grey thick bedded limestones of this period are seen, and in the numerous blocks piled up there you will find the remains of organisms that abounded in the water from whence this limestone was deposited, consisting chiefly of Brachiopods such as *Spiriferæ*, *Productæ*, *&c.*, and numerous

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fragments of *Crinoids*, some beds full of these remains. Other strata contain masses of corals in fine preservation, belonging to the group of reef-building genera. The teeth and fin spines of large shark-like fishes are likewise found in these rocks. Those who desire to see the grandest section of all the beds of the Carboniferous Limestone in our country I should recommend to visit the gorge of the Avon, near Clifton, where they will find this rock in its relative position to the Old Red Sandstone below, and the Millstone grit above. The entire thickness of the rocks here exposed is about 4,056 feet; of these the Millstone grit is 950 feet, the Carboniferous Limestone 2,338 feet, and the Old Red Sandstone 768 feet. Nearly every bed may be examined and measured *in situ* and the changing conditions of the old sea bottom ascertained by a careful study of the successive beds as they lie inclined upon each other in this most instructive and wonderful section. Understand then that the Carboniferous Limestone was a great marine formation, for on it lies the Coal Measures which are for the most part lacustrine or fresh water deposits.

Before passing from the Carboniferous Limestone, permit me to point out to you the physiographical features of the landscape in a region where Mountain Limestone forms the prevailing rock. You see the fine old mural escarpment of the Coldwell rocks, and as you descend the Wye you will find other bluffs of a like character, although in none do you discover such a beautiful picturesque effect as in that rich peep below you. In the Mendip hills, and in Derbyshire peaks and Tors, and in the Mountain Limestone districts of Yorkshire and Northumberland, you will find the same physical features as in the scene now lying before you on the banks of the Wye. Every rock formation has its own physiographical features, its special outline, its internal structure, and the forms of life embedded in it, have likewise their own individuality,

The carboniferous rocks of the Forest of Dean form the gentle swelling outline of hills lying to the eastward of our present position. They consist of Coal Measures with 32 beds of coal 2,400 feet, Millstone grit or Farewell rock 455 feet, Carboniferous Limestone 480 feet, and Lower Limestone and Shale 165 feet. So that the total depth of the Coal Measures of Dean Forest is about 2,765 feet, according to the accurate measurements of Mr. D. Williams, in the Memoirs of the Geological Survey. My friend, the Rev. P. B. Brodie has already given you a lecture from this place on the Natural History of Coal, and I must refer you to the Volume of your Transactions for 1866, for an account thereof.

Between the Dean Forest and the Cotteswold Hills we traverse a portion of the valley of the Severn. Here are developed the New Red Sandstone, Red Marls of the Keuper formation, and super-imposed on them, the Bone-bed, and lower Lias Lime-stones and Shales, and here commences the *Second Volume* of the great rock book, all the forms of animal and vegetable life that abounded in the seas and land of the Palæozoic period had passed away, and no single species that lived in that first period of the world's life is found in that upon which we now enter. Great elevations of the earth's crust took place at the

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close of the Palæozoic epoch. All the rocks around us were then upheaved and dislocated, and the igneous rocks of the Malvern hills were then erupted from earth's central bed. Similar changes took place throughout the world, for with the close of the Palæozoic period a new condition of things was about to dawn. The seas of the Lias contain some new and remarkable forms of animal life, and the land was frequented by some small Mammalia, and flying lizards, or Pterodactyles flitted with expanded wing from tree to tree. The Oolitic rocks of England, which form such an important feature in its geology, were now deposited, and the Jurassic sea which flowed over a large portion of the area which now constitutes modern Europe was studded with coral reefs throughout its whole extent, and the remains of these reefs are seen in the Cotswold Hills, in the Coralline Oolite throughout its entire length from Dorsetshire to Yorkshire, and in the Portland beds of Tisbury, in Wilts; and a like story is told by the contents of the Jurassic rocks of France, Switzerland, and Germany.

Reposing conformably on the Oolitic formations we find the next great series, the Cretaceous deposits these, we observe developed in the rounded downs of Wilts, Berks, Bucks, &c. All these chalk rocks, like the Oolitic rocks on which they rest, were marine deposits, and contain the Reptiles, Fishes, Molluscs, Echinoderms, and other classes of animals that lived on the shores or in the depths of the ocean. They likewise differed specially from the Jurassic forms of the same classes, and possess a *facies* of their own, which the trained eye of the palæontologist detects at a glance.

With the close of the Cretaceous period all these animal forms passed away, and then came the dawn of the Tertiary period, which commences the *third volume* of the Rock Book; in the basins of London and Hampshire and the Isle of Wight; the older Tertiary beds may be studied, but they are too far from our present subject to notice now in detail.

I can only remark that in each of the formations which I have mentioned to-day, we find forms of animal life which are quite special to them; every formation in fact is characterised by its own fauna, and specific characters are much more limited than persons who take a general view of the subject suppose. The deeper we study, and the more accurately we observe, the firmer is the truth established in the mind of the palæontologist, that every great formation possesses its own species of animals and plants; that some have had a longer life in time than others, but that the life of all is limited in duration, and that all the different formations of the Palæozoic, Secondary, and Tertiary Rocks are characterised by forms of life that are special to each great period of the world's history.

I wish to show you an interesting example of one class of phenomena belonging to the Drift period, but before leaving this plateau permit me to point out the evidence you have here of the great erosion or denudation of the surface which has taken place by atmospheric agency. These Old Red Rocks have been peeled and dissected out by the oxygen of the air forming new combinations with the mineral ingredients of the rock masses, and the rain and frost

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have finished the work by removing what the oxygen had commenced to change. Nearly all the denudation changes of the surface over that wide expanse of country lying to the westward of where you now stand is due to atmospheric agency, operating through long, long periods of time. Again, from this spot you see what geologists call faults or dislocations; you observe below you one of these fractures and displacements which has determined the course of the Wye, and caused the river to find its serpentine channel around the Yat. Here, therefore, let me say, before we leave this place to examine the erratic boulder, you have—1st, the agency of fire exemplified in the Malverns; 2nd, the agency of water fully displayed in the conglomerate beds of the Old Red Sandstone and other sedimentary rocks; and, 3rd, atmospheric agency demonstrated in the enormous denudation which has taken place in all the red rocks, forming the Devonian landscape before us (applause).

The party then proceeded to the private grounds in the Yat to examine a large boulder of hard yellow sandstone called "Pennant," which is here seen resting upon Carboniferous Limestone, and has been brought into its present position by some powerful agency, for it is clearly a rock mass that has been transported from a distance, there being no such rock as that of which it formed a part in the vicinity of Symond's Yat.

Dr. WRIGHT observed that the history of erratic blocks formed a wonderful chapter in the *fourth volume* of the Rock Book, and the true explanation of the force that had moved these enormous masses of rocks from great distances and over planes, rivers, lakes, and seas had been reserved for the men who were our contemporaries. Ice was the great transporting agent, and the old Glacier in the valley, or the Berg in ocean were the means by which these transports were made. Perhaps, he said, I can best explain what I mean if I show you the photograph of the *Pierre-à-Bot*, kindly sent to me by my friend Professor E. Desor of Neuchâtel; it is one of the many large erratic blocks that have been transported from the chain of Mont Blanc on the surface of the large glacier that once extended across the plain of Switzerland and shed its enormous fan-shaped terminal moraine upon the slopes and valleys of the Jura mountains overlooking the Swiss plain. This granite boulder is in length 53 feet, in height 43 feet, and in breadth 20 feet; it contains about 40,000 cubic feet of a beautiful greyish granite, Protogine, of considerable hardness with large crystals of feldspar of a milk whiteness, or tinted violet, united to crystals of quartz and grouped between brilliant plates of greyish or blackish mica. This gneissic granite is derived from the red Aiguilles of Chamouni which make part of the massive structure of Mont Blanc, distant about 70 miles from its present resting place on the flanc of the Chaumont, three miles from Neuchâtel, and at an elevation of 900 feet above the Lake: no force in nature but ice could have

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transported this rock-mass from the valley of Chamouni to its present resting place, for in its voyage from the Glacier of the Arve, the block must have crossed the lake of Geneva, the valley of Switzerland, and the lake of Neuchâtel (applause).

The photograph handed round by Doctor Wright, taken from the natural block with some figures beside it to show their comparative size to the mass, was largely inspected by the group.

After such an example the Doctor adduced, it is easy to understand how this block of Pennant Sandstone was removed from its original bed to the limestone of the Yat, for as the whole valley of the Wye affords evidence of glacial action. Doubtless this great natural force was the agency by which it was transported hither. This Pennant rock where it now stands is entirely out of its natural position, and therefore was lifted into its resting place by glacial action (applause).

The whistle announced that the hour for departure had arrived and the party descended to the river, examining the fine section of the Old Red Conglomerate which they passed in the winding path to the ferry boat.

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ON THE CORALLINE FORMATIONS OF THE OOLITIC ROCKS.

BY THOMAS WRIGHT, M.D., F.R.S.E., F.G.S.

In acknowledging the vote of thanks so handsomely proposed by Dr. Bull to Dr. Wright, for the address he had delivered from Symond's Yat, on the Geological features of the landscape, Dr. Wright said that there was one subject, upon which, had time permitted, he should have wished to say a few words, when speaking of the Cotteswold Hills and the Oolitic formations in general, and that was in regard to the fact that the Oolitic rocks appeared to have been formed in a coral sea, probably analogous to that which now rolls its waters in the Pacific between 30 degrees of each side of the Equator.

In the Lower Oolites of England we find a succession of four or more Coral formations, one above another, with great beds of mollusca between them. The Middle Oolite is remarkable for the number and extent of its Coral reefs, and the Upper Oolite for the Coral beds found in the Portland Oolite near Tisbury, in Wiltshire. In fact, the Oolitic group was accumulated under many changes of condition; but the idea of a coralline sea in a slowly subsiding area appears to give the nearest approach to that which then prevailed. The Jurassic waters were studded with Coral reefs, extending over an area equal to a great portion of what is now modern Europe. This is proved by the geographical distribution of their Coralline formations. They stretch through England in a diagonal line from Yorkshire to Dorsetshire; through France, from the coast of Normandy to the shores of the Mediterranean, forming besides a chain which extends through the central region, from the department of the Ardennes in the north, to Charente Inferieure in the south, including Savoy, the Hautes-Alpes and Basses-Alpes; the Jura chain of the Haute-Saône and the Jura Franche-comté, and the Jura chain of Switzerland in its entire length from Schaffhausen on the Rhine, to Coburg in Saxony, and along the range of the Swabian Alps and the Franconian Jura. Throughout all this widely extended region Jurassic rocks and Coralline strata were accumulating by the living energies of Polypifera through countless ages, as all the different beds of madreporic limestone in the Lower, Middle, and Upper Oolites had been formed by the life energies of different species of Anthozoa, and if we might venture to estimate the lapse of time occupied in the accumulation of the Oolitic Coral beds, by what we know of the duration in time of the life history of some exist-

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ing species of Corals, the Jurassic age must indeed have been one of long duration; for example, it has been calculated that the recent coral formations in the gulf of Florida, measured by the time ascertained to have been occupied in the growth of individual species of Coral now living in the gulf, could not have been less than seventy thousand years. The inner reef on the land and the outer reef in the water having been constructed by the same species of Polypifera. This is a subject of great interest, and opens up to naturalists a new field of investigation. Perhaps the wonderful subject of Geological time will receive some important elucidation when we come to study more in detail the history of the Jurassic formations, viewed in connection with the Coralline structures that enter so largely in the natural history of this group of rocks.

It is impossible, without the aid of pictorial illustrations, to make this subject clear in an after-dinner speech, nor would it now have been introduced at all, had not my learned friend, your esteemed President, pressed me to make a few passing remarks upon a subject which he knows has occupied my attention for some time past (applause).

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THE ROYAL FOREST OF HAYWOOD.

BY THE REV. THOS. PHILLIPPS, M.A.

It has been remarked by early writers that many of the English nobles selected marshy situations whereon to found their future homes and estates, and, with every allowance for modern draining, it is surprising in how many instances this remark still holds good. Earl Malmsbury accounts for this by the fact that the larger varieties of game, Deer, Boars, &c., are much more abundant in marshy situations; and for this same reason we can easily understand why the Forest of Haywood should have been the noted resort of game we know it to have been in early times, since the original forest included Allensmore, Coedmore, and other portions which are still wet localities. Hunting was the half-business of life with the barons or nobles in ancient times, and thus we account also for Hereford, from its convenient situation to one of the best hunting forests in the kingdom, having been so much frequented by our Saxon and Norman Kings.

Hereford itself in very early times was little else than an encamped station, chosen and maintained by our original British ancestors to guard a much frequented ford or passage of the Wye, as in those times, when nearly the whole country was over-run with wood, a passage or way to the ford was of much more importance than the ford itself. It is stated in the Archæologia Cambrensis that this encamped station was called by the Britons Hênfford, or the old road, though it seems probable that the present name of Hereford is a mixture of the Saxon "Hare," ancient, venerable, or long used, and the British "fford," a road, pass, or ford. It seems to me, also, that the name of "Haywood Forest" is a mixture also of these two ancient languages, Haer or Hay, which is a proper name, and the British, or still English word "wood."

I will only observe further, before I begin this little history, that in Roman times Magna Castra, or Kenchester, was certainly the great place or capital of this district; and so also in Anglo-Saxon times that Sutton, or South-town, and not Hereford, was almost as certainly the chief place or capital of the district.

A paper in the Archæologia Cambrensis (vol. 5, 81) gives the following extract from Leland: "There is great likelihood that Sutton, at such time as Kenchester stood, was a mansion or palace of King Offa, while Hereford was a beginning." A sentence which intimates pretty plainly, that when Offa held his Court at Sutton, Hereford was in its earliest infancy. There is an old idea taken from the Welsh Triads—which, by-the-way, are very imperfectly understood—that a Bishop of Hereford attended a council at the Metropolitan See

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of Caerlleon-upon-Usk, in the middle of the 6th century,—but those who hold this idea will have to show first that Hereford itself had an existence in the middle of the 6th century, beyond what it has been here represented, as simply an encamped station of the ancient Britons, afterwards held by the Saxons.

Mr. Sharon Turner, in his "History of the Anglo Saxons," referring to the ancient Saxon Chronicles for his authority, states that Hereford remained a mere station for guarding the "Hare" or ancient way across the river Wye to Haywood or elsewhere, until the notorious and treacherous murder at Sutton, of Ethelbert, king of the East Saxon, by Offa. Or, in other words, Haywood Forest, as a hunting locality in those ancient times was better known than Hereford itself.

The murder, however, and the treacherous manner in which it was carried out, brought such a scandal upon Offa and his whole Court, that Putta, a pious Bishop of South Mercia [it will perhaps be better to call him, since there was at that time neither county nor town of Hereford in existence], pronounced a sort of malediction upon Sutton.

At the death of Offa in 794, the Saxon Chronicle gives the total population of Hereford at only 70 souls, including the encampment; and yet we are distinctly told that Mercia at this time was divided into two dioceses for religious purposes. This Putta, who was Bishop of the Southern diocese of Mercia, and probably resided at Sutton, delivered a sort of prophecy [and local and unauthorised prophecies were not uncommon in those superstitious times] that Egfrid, the son of Offa, should not live to reign three years over Mercia, as a judgment or visitation of the sin of the father upon the son, for his having murdered Ethelbert. This prophecy proved true. Egfrid died within the specified time, and Milfride, who was a prince of royal blood, and succeeded to the rule of South Mercia, resolved upon moving his Court from blood-stained Sutton to Hereford, which was then "a beginning"; and then, and not till then, as it seems to me, could Hereford have been either a City or a Bishop's See.

Offa, before his death, had obtained absolution from Pope Adrian I., on these conditions, 1st, that he should erect a church at Marden, an adjoining parish to that of Sutton, over the grave of the murdered Ethelbert; 2ndly, that he should erect a church of stone at Hereford dedicated to him; and, having done so, he was, 3rdly, to translate the body of Ethelbert to this church of stone or cathedral *(Archæologia Cambrensis)*. And Ethelbert himself, because he was murdered, seems to have been sainted.

Be this as it may, the task and duty of erecting a church of stone at Hereford seem thus to have fallen upon Milfride; and he, as we learn from Blount's MSS. [kindly allowed to be seen in the library of St. Michael's Priory at Belmont], feeling the responsibility of his task, "ordered a certain devout bishop to come to his aid; but he being at the time in a distant part of the kingdom of Mercia, and travelling then being very difficult, he sent a great sum of money to Milfride, who, with this and other contributions, began with great

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devotion the building of a noble church of stone at Hereford." This, without doubt, was the foundation of our present cathedral, and it has continued a "noble church of stone" ever since, with numberless additions and improvements.

The stress laid upon the word "stone" in Blount's MSS. arose from the fact that all ordinary churches in those days were erected with timber; and at this time there is a very interesting specimen of this form of architecture to be seen in the detached belfry of Pembridge church. It is well worthy of inspection from the peculiar construction of its interior timber work.

In proof of the very small population of what we now call the county of Hereford in Saxon times, and how much rather it was a wooded and a hunting district, it is stated as late even as the Doomsday Survey, that Hereford-burg contained only 70 inhabitants, Clifford-burg 16 inhabitants, another only 9; and that the whole county of Hereford had but 37 chief proprietors: (Sharon Turner, vol. 3—250). It is not likely, therefore, that Hereford should then have been the See of a Bishop.

The original capital of the extensive kingdom of Mercia was Coventry, and Offa, of whose energetic rule we have many proofs, founded, for the better government of the southern portion of his dominions, a second capital, or fortified palace where he held his courts, &c., at Sutton, or Southtown, which he so named in contradistinction to his northern capital at Coventry. And as kings in those days half supported their retainers by the larger descriptions of game, Deer, Boars, &c., so it is not unlikely that Offa may have been influenced in his choice of Sutton from its vicinity to the noted Forest of Haywood. Well then, with regard to Offa, and his rule at Sutton, Mr. Turner (History of Anglo Saxons) informs us that the king's three principal manors around Sutton, and which he claimed as his own especial demesnes, were—Malden, or Marden, Wormelow, and the Forest of Haer or Haywood.

Marden manor, which then as now contained much fertile pasture land, is stated to have supplied the king's horses with grass, several families on the manor having held their right of citizenship in Sutton on condition of their cutting a sufficiency of grass daily for the wants of the king's horses.

Wormelow-manor, having been a corn-growing district, the same as it still is, seems to have supplied Offa and his retainers with that necessary commodity. The present Tump inn at Wormelow continued to be a Hundred House until the last century.

Haywood then, as now, was pre-eminently *de-Foresta*—a wild district abounding with game—Deer, Wolves, Bears, Foxes—not to mention Eagles, Falcons, Kites, &c., which last I remember myself as not uncommon in the district, and Bees. Thus Haywood was a noted locality at a time when Hereford was little more than an encamped station to guard the Hên or Hare-fford or way leading to it.

According to Warrington (History of Wales) the first bridge at Hereford was erected at, or about the same time as the building of the "noble church of

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stone" there by Milfride, and the stone for it is mentioned in both cases as having been supplied from the king's quarries at Haywood. An excellent quarry of stone, precisely similar to that of which the cathedral and bridge at Hereford are built, exists there still. Indeed, F. R. Wegg Prosser, Esq., the present owner of Haywood Forest, is at this time refacing his house at Belmont with stone, chiefly from the same quarry.

Hereford and Haywood Forest were so dependant upon each other in very early times that it is almost impossible to give a sketch of the history of the one without including the other. As many families at Malden or Marden held their right of citizenship in Sutton by supplying grass for the king's horses there; so every house in Hereford, A.D. 1017, in the reign of Edward the Confessor, was obliged by similar tenure "to furnish one man to assist in taking the game when the king hunted in the Forest of Haywood," and there is not a doubt that the attraction of hunting in Haywood Forest was the chief cause of the not unfrequent residence at Hereford of several of our early kings.

The same law or custom of serviture of the citizens of Hereford to assist when the king hunted in Haywood Forest continued in force under William the 1st, and several other of the Norman kings after the conquest in 1066.

The present extra-parochial "Liberty of Haywood" does not much exceed fifteen hundred acres; but in early times, besides this, the forest contained also, nearly, if not the whole, of the present parish of Allensmore, the common of Coedmore, a large portion of the parishes of Callow and Dewsall, the township of Grafton, and Belmont, down to the Wye. I am inclined to think also, from an entry in Blount's M.SS., that the manor of Warnham (Warham), on the north side of the Wye, was likewise included in the Royal demesne of the Forest of Haywood.

Mr. Warrington, in his History of Wales, tells us that the chief game in the Welsh and Border-forests was the Stag, the Roebuck, the Hare, the Wild Boar, and the Bear, which were most sought after and best esteemed for eating; and the Wolf, Fox, Martin, Polecat, and Squirrel, which were occasionally hunted for diversion. Of birds, the chief sought after were the Cock of the wood or Capercaile, and the Wood-grouse, which latter were usually found on the ground, and hunted with dogs; as, although called the Wood-grouse, it does not take to the trees until alarmed, and then flying only to the lower branches is easily knocked down with sticks or poles.*

Forest hunting in those days was a very clamorous diversion. It was attended by a great many persons as actual hunters who carried horns, and these had under them a number of beaters and markers.

"When the Stag, Roebuck, or Wild Boar were objects of the chace, the chief implements carried by the hunters were spears and nets; and it was carried on with the distinct intention of obtaining a supply of game for the

* I have shot at Capercaile with a pistol out of the kabitka or carriage window when travelling in the Government of Archangel in Russia. Stopped the kabitka and hallooed at it without the creature flying away.

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King's table, and that of his followers. Whereas, when the Wolf, Fox, Bear, and the wilder animals were the object of chace, a number of dogs were employed, and it was called a barking hunt; and besides these too, a number of beaters with sticks and poles were employed, as it was thought the greater the noise the greater the chance of success."

A third object of chase in those days was a swarm of bees—honey having been much prized—and nobody kept tame bees then as is so commonly done now.

The ancient royal law in regard to Hereford was, for every house to furnish a man to assist in taking the game when the King hunted in Haywood Forest; and at Shrewsbury, Mr. Sharon Turner tells us (vol. 3, p. 64), that when the King hunted in that vicinity, the law or custom was, for "all the most respectable burghers who possessed horses, to attend with arms, and serve as his guard. And it was the duty of the Sheriffs likewise to send out thirty-six men on foot, to be stationed at the hunt whilst the King was there." Neither was the precaution in those times altogether unnecessary. We all know the tyrannical manner in which whole districts were afforested, villages destroyed, not to mention the extreme severity with which forest laws were enforced. Secret revenge therefore, or retalliation, must not unfrequently have existed.

So onerous were the duties imposed upon citizens in those days by their conquerors, and so rigorously were these services and charges exacted, that Mr. Turner tells us (vol. 3, 108), as it related to Hereford, that if anyone wished to sell his house and retire from the city, he might do so with the leave of the Gerefa; but that this leave was never granted unless the purchaser was both willing and able to perform the accustomed services to the king. And more than this, too, if he left without the Gerefa's permission, he was compelled to give up his house without any compensation, and "the Gerefa had then to take care that the house did not long remain empty, that the king might not lose his dues." "The Gerefas were officers appointed by the Executive power. In rank, they were inferior to the Eorl, or Ealdoman (Alderman), but next to him" (Turner 3, 228).

Mr. Turner, on this subject, gives us a curious dialogue which took place between one of the Saxon Kings and a new Burgher, as to his qualifications to fulfil the duties he was about to engage in.

New Burgher: "I am a hunter."

King: "How do you exercise your art?"

Burgher: "I spread my nets and set them in a fit place, and instruct my hounds to pursue the wild Deer till they come to the nets unexpectedly, and so are entangled, and I slay them."

King: "What other game are you able to take?"

Burgher: "Harts, Boars, Goats, and sometime Hares."

King: "Have you hunted lately?"

Burgher: "Yes, only yesterday, when I killed a Hart in the nets, and a Wild boar I slew."

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King: "How dared you slay him?"

Burgher: "The hounds drove him to me, and I, standing opposite, pierced him."

King: "Thou was bold."

In proof of the severity of game or forest laws in those days it is stated that even travelling was attended with some penal regulations: as if a stranger in any part went out of the road or through woods it was a law that he should either shout aloud or blow with a horn, on the pain of being deemed a thief or purloiner of the King's deer, &c. From the peril of the roads in those days, the poverty of the middling and lower orders, and the violence and rapacity of the barons and knights, which was very notorious, travelling was a very rare occurrence even for mercantile purposes, and for pleasure, as in these days, it was almost unknown. Few men, in fact, then, left their towns or burghs but for pillage or revenge, and this law, therefore, in regard to travellers, was by no means needless. It may sound strange to us, too, for a person setting out on his travels to carry a horn with him, but the fact is that up to even a comparatively late date, many of the English roads were in such a bad and intricate condition that a horn to show the whereabouts or to sound for assistance when a traveller lost his way was a real necessity. Even in my younger days the Herefordshire lanes were so narrow and the hedges so high that a farmer's waggon, if sent off its own premises, almost invariably had a sort of arched bow over the collar with four or five bells suspended in it, which could be heard a mile or more in advance by a team coming in a contrary direction, and thus give notice in time to draw aside in some gateway or wide place. To pass, otherwise, would have been literally impracticable.

The eccentric Sir Charles Hanbury Williams, of Coldbrook-house, near Abergavenny, writing to a friend in London on the state of the roads in Monmouthshire in 1743 says, "O, as for roads, our highways are ditches, and our lanes watercourses;" and till within these ten years, or less time, one or the principal roads leading through the village of Ewyas Harold was literally a watercourse.

But to return to the tyranny of Kings and the Forest laws of the olden times. By a law of Canute the Dane (1020). The barons or higher-orders, who were then few in number, were allowed "to hunt in fields and woods that were their own, provided it did not interfere with the King's hunting." The Anglo-Norman kings punished persons killing deer in the Royal forests, which were then numerous, "sometimes by actual hanging, and frequently by loss of limbs, putting out the eyes, or other mutilations" *(Warrington)*.

Haywood, as already shown, was a Royal forest at a very early period, and noted for the abundance and variety of its game, nevertheless it is only from casual references that we can obtain any positive data respecting it. Mr. Blount, in reference to it, informs us in his M.S. that in the reign of Stephen (A.D. 1140) a Henry de Kilpeck, Lord of Kilpeck Castle, was fined 100 marks

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for trespassing in the Royal forest of Haywood, and for owing an arrear of thirteen hawks, which he ought to have furnished to the king from the Forest of Trevil. A.D. 1193.—John de Kilpeck, who succeeded the above-named Henry, is related to have obtained a grant from King John, to the effect that "neither himself nor any of his Heyrs (heirs) should be outed from the Bailywic of the Forest of Haywood."

A.D. 1207.—A Hugh de Kilpeck is mentioned as having succeeded to the office of Custodian of the Royal Forests of Herefordshire, viz., Haywood, Trevil, Deerfold (or Darvold), &c. And this Hugh de Kilpeck dying early and without a family, his widow Egidia is related to have married William Fitz-Warine (Warren), by whom she had two daughters, the eldest of whom married Robert Walraund, and he, through his wife, succeeded to the Kilpeck estates. Up to this time, in consequence of the grant made by King John, the custodianship of Haywood Forest, &c., seems to have gone with the Kilpeck estate. But now, getting into a different line, the right seems to have been disputed; but this was got over by Robert Walraund "paying a fine of 300 marks in gold to the King," and in return for which he was allowed to succeed also to the "Bailywic of Haywood and Coetmore (Coedmore)."

A.D. 1269 (52 of Henry III.) we find a "Robt. Walraund marrying Maud, the daughter of Ralph Russell, nd he finding himself likely to die without heyrs, gave to Alan Plugenet, his sister's son, the reversion of his castle of Kilpec, with the lands and woods of his park at Trevil and Coytmore, and the Forestership of Haywood, with the Manor of Warnham" (Warham).—(Blount's M.SS.)

"Alan Plugenet was a baron much esteemed by the king, and at his death 23rd Edward 1st (1295) he bequeathed to his son Alan his estates at Kilpec, &c., as well as a grant from the king, allowing a market to be held weekly, on Fridays, at the township of Kilpec, as well as a fair to be held there yearly on the day of the Holy Assumtion." A sort of fair was held at Kilpeck until a comparatively few years ago, but I can find no traces of its market or market-place. Allensmore (or Alan's More or Marsh) derived its name from this Alan Plugenet, he "having by his skill brought that portion of the original Forest of Haywood into a fit state of cultivation," and therefore made it of more value to the king. This must have taken place between A.D. 1295 and 1300.

The Rev. C. J. Robinson (Castles of Herefordshire) in an extract from the Harleian MSS., relates another circumstance in which the Forest of Haywood is mentioned, about A.D. 1230: "After the repairs of Hereford Castle by Henry III. an affidavit, in which John-de-Werrer and Roger-de-Werrer, surveyors of the king's works and engines of war, there made oath that certain amounts of oak timber and the necessary quantities of stone for the same had been dug and obtained from the said king's Forest of Haywood." About the year 1325, mention is made of an Edward de Bohun, a large holder of lands in the Welsh Marshes, as having "obtained a license from Edward III. to grant to his

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relative, James Butler, the first Earl of Ormond (who seems to have married a Walraund) the Manors of Kilpec and Trevil, with the Bailyship of the Forest of Haywood." (Blount's MS.)

The Bohuns, after this, got into disgrace in the Wars of the Roses, during which one or two of them lost their heads. But on the success of the cause of York, and Edward 4th coming to the throne (1461), these offices and manors were restored to John de Bohun, the sixth Earl of Ormond.

After this date there seems to be nothing worthy of remark in regard to the Forest of Haywood, beyond the fact of bailiffs or custodians, having been, from time to time, appointed to it by the Crown.

In the 20th of Elizabeth (1578), a deed in the Record Office in London, states the fact of a Sir John St. Leger being custodian of the Queen's forest of Haywood, and "lord of the manors of Allensmore, Deweswall, Grafton, and Callowe in the perambulations of the same forest, until (at that date), deposed therefrom by injunction from Exchequer."

Who this Sir John St. Leger was, I am not aware, except that at this period, and for some time previous, the Herefordshire Forests under the Crown (that is, since the division of England into counties) seem to have gone a good deal together, especially that of Trevil, usually held by the Lord of Kilpeck, and whose boundaries must be less than three miles, from the original boundaries of the Forest of Haywood.

In September 1639 (Blount's M.SS), Kilpeck came into the hands of "the Pyes of Saddlebow, the Mynde, and Bryngwyn," and there is every reason to believe that the Bailywic or custodianship of the Haywood and Trevil, at least, went with it, and that this continued until the reign of George 1st (about 1720), when many alterations were made in the forest laws, and several forests, that of Haywood amongst others, were more or less completely disafforested, and their lands either granted or sold to private individuals, and thence has come its descent to the present owner, F. R. Wegg Prosser, Esq.

Haywood, however, and the same with Trevil, continued, and to some extent still continues, extraparochial, and enjoyed several privileges, such such as being both rate and tithe-free. However good these privileges may have been for the landowners, they were quite the reverse for the poor, who after a time became inhabitants of the forest, and who, when in want or distress, had no legal resource whatever to depend upon. The landowners, for a time, took care of their own poor, but as these increased in number, and two or three hard cases were brought to light, a legal power was granted about seven years ago (1863), enabling the then inhabitants of the Forest of Haywood, to raise a rate or rates among themselves for the relief of their poor, upon precisely the same principle as in regular parishes, but the repairs of the roads now traversing the forest still continues in the hands of the landowner.

Such then is Haywood Forest in the 19th century. But I must not conclude this imperfect little sketch without making some allusion to the

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real incident which gave rise to the very first poem of any importance which our own Milton ever wrote.

And this incident many still suppose (though others deny it) took place in this same Forest of Haywood. This circumstance, however, is unimportant, any further than as serving to show what a place of note the Forest of Haywood had long been, and even then continued to be. I will only premise further by saying that the heroine of the Mask of Comus with her friends were travelling on horseback, which was usual in those days, when roads were not only bad but exceedingly intricate, On the 26th June, 1631, the Earl of Bridgwater having been appointed President of Wales, or the Welsh Marshes, took up his official residence at Ludlow Castle, which was the usual residence of the Welsh Presidents; and when, as an old MS. states, "he entered the castle amidst the discharge of the great guns and firelocks of the soldier, attended by all the officers magnificently dressed and mounted. And so great was the pomp that the like thereof was never before seen in those parts." Wright ("History of Ludlow") tells us also that a large assemblage of neighbouring nobility and gentry had been invited to the castle. And, amongst others, "the Earl's sons, the Lord Brackley and Mr. Thomas Egerton, and his daughter the Lady Alice; and these being on their journey from Gloucester—

——— to attend their father's state,
And new entrusted sceptre.

were benighted in Haywood Forest, in Herefordshire, and the lady for a short time lost. The adventure being related to their father on their arrival at the castle, Milton, at the request of his friend Henry Lawes, who taught music in the family, wrote the 'Mask of Comus.' Lawes composed the music, and it was acted on Michaelmas night, the two brothers, the young lady, and Lawes himself bearing each a part in the representation."

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ON COLUMNAR GROUND ICE.

By T. ALGERNON CHAPMAN, Esq., M.D., Abergavenny.

There is a remarkable form of ice found on the surface of the ground, which I have often noticed, and on which I last winter made some observations with the object of determining the causes of its peculiar structure.

The peculiarity of this ice that is most likely to attract attention is that it is formed where there is apparently no water, or at least that a considerable mass of transparent ice is formed on the surface of the earth in places that are often dry, and even in winter, though the ground may be very wet, there is practically no water separable from the earth which it saturates. Its most distinctive character, however, is the beautiful columnar forms it assumes—from simple pillars and groups of pillars, to arches, colonades, and labrinthine masses.

The only paper on the subject I can find is one "On Columnar Crystallization of Ground Ice," in the *Edinburgh New Philosophical Journal* for 1850, by the Rev. Dr. Scoresby, whose name is so well known in connection with arctic exploration. He describes and figures numerous forms of this variety of ice, but offers no observations bearing on its mode of formation, and hardly offers any theory except the suggestion that the electric condition of the earth and air are the determining causes of its peculiar structure.

Recently there have been several short notes on the subject in "Nature," but the Columnar form of ice is apparently confounded by several writers with Prismatic Ice. The form of ice to which I think the term prismatic should be restricted occurs when a mass of ice formed or resting on the surface of the ground is slowly melting at a temperature very close to 32°; at least these are the conditions under which I have met with it, and it has been described as so occurring. Under these conditions the ice forms itself into a number of portions easily separated from each other, but fitting accurately together so as to preserve the outlines of the original mass of ice. Each of the pieces is of irregular prismatic shape, with flat sides and tolerably sharp angles, varying in size up to half an inch in length or even much longer, and with differing numbers of sides (usually 5 or 6), and variously angled ends, in short irregular prisms and in no sense crystals, nor do they appear to have any relation to the crystalline structure of the ice, excepting that the axes of the prisms are perpendicular to the original surface of the ice. The structure depends probably on causes similar to those that lead to the prismatic structure in basalt, i.e., to contraction from a change of temperature, in the present instance not on a depression but on an elevation of temperature.

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The term Columnar is applied by Scoresby to that form of ice which is more especially the object of this paper, and is accurately descriptive of it. He adds, however, the word crystallization, apparently regarding each column as a crystal. It is not so, however, each column being rounded and excepting that the intimate structure of all ice is of course crystalline, to call these columns crystals must lead to misapprehension. I ought to add, perhaps, that I provisionally retain for it Scoresby's name of ground-ice, which also well describes its usual situation. I do not know whether this form of ice or that which forms in the beds of rivers has the prior claim to the name, but as they are very distinct phenomena, the one that has not the priority ought to receive a different name.

The usual position in which this form of ice is to be met with is an inclined surface of earth, occasionally it is to be seen on level ground, but its peculiar structure is then rarely so clear and distinct, principally, I believe, because the supply of water necessary is apt, during frost, to fail on level ground; the beautiful instance observed by Scoresby occurred in such a situation. The place where I most carefully examined it was on a steep clayey bank, at an angle of 70° to 80° to the horizon.

On this bank, after a few nights sharp frost, the thermometer being at or below 20°, there would be a coating of clear ice of five or six inches in thickness, not solid but full of perforations of $\frac{1}{4}$ to $\frac{1}{2}$ an inch in diameter, traversing it perpendicularly to the surface of the bank, so that looking along these perforations the clay of the bank could be seen behind the ice. Often these perforations were of simple cylindrical shape, more usually of complicated outline from several cylinders coalescing to form one space, so that the configuration of the ice between them might be briefly described as labyrinthine. Nevertheless, the ice is sufficiently strong to make it a matter of some difficulty to remove a portion. On doing so it is seen that the icy columns dwindle away towards the bank in some places, in others they become wider and thicker. The surfaces of the columns of ice are smooth and rounded, not angular and crystalline. In some parts of the structure the air spaces so preponderated over the ice that the latter was reduced to a number of completely isolated columns, looking like icicles growing upwards instead of downwards. Sometimes such columns having, to a certain extent, fallen together by their own weight, were, nevertheless, tolerably perfect for several inches in length, and of diameters varying up to a quarter of an inch. Usually this more strictly columnar form was much marred by the ice having fallen away from the bank in patches, upon which a fresh crop appears, all usually more or less twisted and contorted. I have seen many intermediate forms connecting this with the variety that I have called labyrithine, showing that their mode of formation is the same.

The surface of the ice was usually soiled by a little clay raised from the bank, and the ice was divided into strata by layers of clay-soiled ice. I found that the strata of ice corresponded in number with the number of nights of frost,

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the clay-soiled line representing the day time, during which freezing did not occur. This appeared to be proved by removing a portion, leaving the bank exposed, and by finding the exposed space next day covered by a fresh layer of ice a little over an inch in thickness, and the surrounding ice thickened by nearly the same amount, and presenting a clayey line at nearly the same distance from the bank. It also proved what was perhaps sufficiently plain before, that the ice grew from the bank.

But why does it assume this peculiar structure? In the first place, on removing any of the ice it is seen that the bank is wet, so slightly, however, that it requires some attention to detect that there is an actual trickle over its surface; and, secondly, that the water is supplied by the bank itself, that it does not flow over it from the top, but flows out of it in a multitude of tiny springlets. This trickling water will not freeze at the bottom of the air columns, as air is a very bad conductor of heat, but where the base of each ice column ouches the bank, the ice being a better conductor, will more effectually abstract the heat from the trickling water at the same time that it offers it a suitable material on which to crystallise, and the base of each column will thus grow by addition from beneath. This is strictly parallel to the case of the ribs of ice that form beneath the continuous surface layer at the margin of ponds and rivers when the water is falling. The ice that is left by the water of course ceases to increase in thickness, but as it conducts the heat from the ice in contact with the water, the ice thickens more rapidly at the line where it meets the water than elsewhere, and when the water falls still lower this thickened portion often remains in contact with it when the water has receded from the ice at a further distance from the bank, and if the water fall gradually enough afterwards freezing may continue along this line until a very thick rib is formed, thicker, it may be, than the solid ice, as the ice on either side of it having no water to freeze conducts the heat from the rib of ice instead. These ribs are often very numerous and obvious in mere puddles and ditches, but the ice being more rigidly supported across a small area somewhat complicates the question of their formation, the capillary attraction between the water and ice being an important element in determining their position.

It may be objected here that the ice either does, or with the first slight addition will, touch the clay bank so closely that there can be no more room for a further layer. The force manifested during freezing is, we know, immense, and heavy as the whole sheet of ice is, this force is doubtless sufficient to raise the whole mass, though it is one solid piece, and apparently as immoveable as a mass of iron. This consideration led me to expect to find the labyrinthine pattern of the ice imprinted on the wet clay of the bank, but nothing of the sort is to be seen. There is however, I think, a fallacy involved in expecting it. Though the whole force required in raising the mass of ice, say one inch from the bank, is very great, the freezing at the base of each ice column has only to raise that particular column, and at the rate say of only one inch in twelve

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hours, and the direction of the motion is not vertical, but only little removed from the horizontal,—when the ice is formed on the ground the thrust is of course upward,—so that in reality the actual pressure at any one point is always very slight. The growth of the icicles of the separately column form is explicable in precisely the same manner. And it seems easy to understand how the ice is formed, when once a beginning is made, but how does the formation commence? I believe that at first a tolerably uniform but very thin coating of ice forms over the wet surface of the bank. When water, say from a spring, runs over the surface of the ground in a sharp frost, the first-formed layer of ice adheres to the ground, the water flows over it and the ice thickens from its upper surface. This does not happen in the case before us, because, as I have already said, the water does not flow over the bank from one source alone, but appears in minute quantity over its whole surface. The water, therefore, continues to trickle beneath the ice, and air is drawn in beneath it, and as the ice thickens it is imprisoned as rounded or irregular bubbles, and the intermediate spaces are the tops of our ice columns. But ought we not to find the columnar ice covered by this thin ice pellicle? As a matter of fact we do find that the openings of the air tubes are narrowed by a thin edge projecting over them, which is part of the pellicle. The rest being much thinner may very easily have disappeared by evaporation. Though I incline to this explanation of the first formation of the ice, it follows from the condition of the water supply that the air spaces may take their origin from being opposite the actual minute springlets and therefore freezing does not occur at these points.

I have seen it suggested that the columns of ice each represents one of the springlets, the water freezing as it appears and the force of the issuing water raising the ice as it is formed. This can hardly be the case, as the water trickles over the outer spaces in a tolerably uniform layer, it would be most unlikely to freeze at those points where it issues from the ground, and the pressure of the water would be quite insufficient to raise the ice, unless the water escaping from each opening were confined by the ice being frozen to the ground around it, which evidently does not occur.

The surface of the ice is often covered with bits of the soil from the earth beneath, the particles having been frozen in with the first pellicle of ice, and in that form which I have compared to a bundle of icicles on account of each column being separate, each column often has a bit of dirt on the apex, as though a point of earth projecting from the bank had been first frozen, giving the starting point, which after the formation of the ice seems easily understood.

In some cases I have found the ice structure behind a layer of frozen earth of nearly half an inch in thickness, and usually rather dry and crumbling. The drier earth on the surface soon freezes and takes the place of the theoretical pellicle which appeared necessary when the surface of the ice is nearly free from earth. The columnar ice begins to form at the surface of that layer of earth which is wet enough to afford a continuous supply of water.

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The formation of the ice behind a layer of earth usually occurs on more level ground, because, I believe the ground is rarely wet enough close to the surface to afford a proper supply of water.

As a detail it may be interesting to consider how the icicles of the columnar form, become contorted. The most common form of this is for their extremities to be curved downwards as if they had bent with their own weight, and this is strictly true, though the bending occurs during and not after their formation. When a minute portion of the column is formed, it retains its position against the bank solely by capillary adhesion, and consequently, hangs by its weight a little downwards. Its growth is however directly outwards, and so long as the growing icicle is retained by capillary adhesion and obtains no support by falling against other columns the result is to produce a downward curve in the ice column; when the ice columns by falling against each other in this way obtain even a slight support they grow directly outwards and are consequently straight. If they do not obtain sufficient support in this way, as soon as their weight exceeds the sustaining power of the capillary adhesion they fall off and the process begins *de novo* (applause).

Mr. Lloyd asked Dr. Chapman some questions with reference to the formation of river ice, which were answered, but the remarks elicited bore upon a different series of facts in ice formation.

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THE MISTLETOE-OAK OF LLANGATTOCK LINGOED.

BY DR. BULL.

"*Est autem id rarum admodum inventum, et repertum magnâ religione petitur*," says Pliny (lib. xvi. c. 44) of Mistletoe on the oak, and it is as rare in our time as formerly, though its discovery now is rather too late in the world's history to make the sensation it would have done in Druidical times. At our last meeting we visited the newly discovered Mistletoe-oak of the Forest of Deerfold, the first that had been found for many years; and I have now to bring forward another example which I visited a few days since.

Mistletoe grows on an oak tree at the Hendre, Langattock Lingoed, on an estate belonging to Miss Davies, of Usk. The oak, *Quercus sessiliflora*, grows in the hedgerow of a narrow coppice by a lane-side. It is probably not more than 80 years old, and at 5ft. from the ground it has a circumference of 4ft. 7in The Mistletoe shoots out by a single stem from the underside of a branch about the middle of the tree at four feet from the main trunk. It forms a thin straggling bunch with long joints and drooping stems, and is not by any means in vigorous healthy growth. It was without fructification, but appeared to be the female plant, *Viscum album fœmina*.

It was first observed during the past winter by Mr. Williams, of the Pentre, but it has probably been there some six or eight years. It does not seem at present to have affected the vitality of the branch of the oak on which it grows.

This is the second known example of an existing mistletoe-oak in Monmouthshire. The other grows on a fine oak at Badham's Court, Sudbury Park, near Chepstow, the property of Geo. Ormerod, Esq. There were formerly several mistletoe-oaks in this county. Jesse, in his "Scenes and Tales of Country Life," mentions three instances in Monmouthshire—one at St. Dials, near Monmouth, another near Usk, and the third at Penporthlenny Goitre.

The St. Dials' mistletoe-oak was cut down by the bailiff about 17 years ago, and the owner of the estate, Sir Lionel Pilkington, dismissed the man immediately for doing so (laughter). The oak which had borne mistletoe at Usk was also cut down with its neighbours in a general fall of timber there about ten years since.

The fate of the Penporthlenny Goitre example is more sad still. "It was most sacriligiously cut down about thirty years ago," says my informant,

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THE MISTLETOE-OAK OF LLANGATTOCK LINGOED.

Quercus Sessiliflora—Viscum album, fœm :

This interesting tree grows at the Hendre, Llangattock Lingoed, Monmouthshire, on an estate belonging to Miss Davies, of Usk. The Oak grows in the hedgerow of a narrow coppice by a lane side. It is probably not more than 80 years old, and at five feet from the ground has a circumference of 4ft. 7in. The Mistletoe shoots out by a single stem from the underside of a branch about the middle of the tree at four feet from the main trunk. It is not vigorous in growth but forms a thin straggling bunch, with long joints and drooping stems. This tree makes the ninth example of an Oak bearing Mistletoe in Great Britain.

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"and hung over the President's chair at the Cymrygyddian at Abergavenny. I saw it there myself, and no doubt hundreds of others did so too." What became of the man who cut it down, or the President himself afterwards, was not stated (laughter).

It's "an awesome thing" to injure a mistletoe-oak. At Eastnor a woodman got up simply to get a spray for a Malvern visitor, when he tumbled down and broke his leg, and when some years after the late Town Clerk of Hereford casually asked the same man to get some for him, he pointed to his leg and said, "Not if I know it," and gave him the history of his former accident (laughter).

A few years since a great amount of trouble was taken in vain to find a new mistletoe oak, but discoveries, like accidents, come not singly. They had already found two new ones during the last year, and therefore, according to the theory of that profound philosopher, the learned Dr. Doubleday, as laid down in the thirty-ninth section, the ninety-ninth chapter, book the seventh, of his inimitable work on "The Doctrine of Probabilities," we ought soon to find one or two more (laughter and applause).

LIST OF EXISTING MISTLETOE OAKS.

EASTNOR PARK, Herefordshire.

TEDSTONE DELAMERE, Herefordshire.

THE FOREST OF DEERFOLD, Herefordshire.

FRAMPTON-ON-SEVERN, Gloucestershire.

SUDBURY PARK, Chepstow, Monmouthshire

THE HENDRE, Llangattock Lingoed, Monmouthshire.

BURINGFOLD FARM, Dunsfold, Surrey.

HARKWOOD PARK, Basingstoke, Hampshire.

And on an Oak, near Plymouth.

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RECORDS OF METEOROLOGY ON THE VARIATIONS OF CLIMATE FOR THIS DISTRICT OF ENGLAND.

BY MR. HENRY SOUTHALL, F.M.S.

It is proposed in the present paper to consider what we may be led to expect in the future from the history and analogy of the past, without, however, entering much into details or venturing to predict any exact time for the recurrence of particular or extraordinary events. The science of Meteorology is yet in its infancy, and it is at the present moment in urgent need of accurate observers, for conclusions of value can alone be drawn from the correct and regular readings of good instruments in as many situations as possible.

THE MOON.—From a very early period the moon has been supposed to affect the atmosphere as well as the tides, to a considerable extent, and the notion is probably as prevalent now as it ever was, that with a change of moon we may expect a change of weather. This idea, after very patient investigation, has been entirely given up by meteorologists. The late Luke Howard, for example, author of "The Climate of London," and than whom no one has paid more close attention to this subject, was unable, after years of consecutive observation, to discover any definite connection between the lunar and atmospheric changes, and when we consider that over a space of the earth's surface which would be equally influenced by the moon's gravitation, the most diverse effects are being simultaneously produced, it does not seem even theoretically probable that such should be the case.

There is more ground for believing that the full moon has a slight influence in dispersing clouds, and that the amount of rainfall is somewhat larger under some phases than under others, but even these suppositions, for they are scarcely more, are, to say the least, very problematical.

A table was published in 1803 by a Mr. Herschel, which purported to predict the weather according to the hour of the moon's changes; but it was very artfully prepared, since it provided also that the wind should be in a certain direction. Thus, in winter, if the wind was in the S.W., warm or wet weather might be looked for; or if, on the contrary, it was in the N.E., snow or frost might be expected, results very likely to follow, quite independently of any lunar influence.

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WEATHER PROVERBS.—From a very early period great interest has been taken in the subject of the weather. This is proved by the number of proverbs and sayings handed down to us from all times. The correctness of most of these at the present time may be said to indicate that the general character of our climate is not materially altered. The following list embraces only a portion of those now in use :—

"January blossoms fill no man's cellar."

"As the days lengthen does the cold strengthen."

"February fill dyke, either black or white."

"Snow lying under the hedges is waiting for more."

"When gnats dance in February the husbandman becomes a beggar"

"Never come Lent never come winter."

"March many weathers."

"March comes in like a lion and goes out like a lamb."

"A peck of March dust is worth a king's ransom."

"A March without water
Dowers the hind's daughter."

"March winds and April showers
Bring forth the fine May flowers."

"A sunshiny shower
Won't last half an hour."

"Small showers last long, but sudden storms are short."

"April cold, and moist, and low,
Fills the cellar and fattens the cow."

"The March winds and the May sun
Make linen white and maids dun."

"There are as many frosts in May as there are in March."

"A dry May and a dripping June
Will put all Nature into tune."

"Water in May is bread all the year."

"Mist in May and heat in June
Make a harvest come right soon."

"Drought never bred scarcity."

"If it rains on St Swithin's day it will rain for forty days."

"Dry August and warm
Doth harvest no harm."

"Rain before seven, fine before eleven."

"Three hoar frosts bring rain."

"There are twenty fair days in October."

"There are fifteen days in November when you don't need a great coat."

"The winds of the day wrestle and fight
Longer and stronger than those of the night."

"If the ice will bear a man before Christmas, it won't bear a goose after."

"A green yule makes a fat churchyard."

"An early winter
A surly winter."

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"A warm Christmas a cold Easter."

"A green Christmas a white Easter."

"Who doffs his coat on a winter's day
Will gladly put it on in May."

"A rainbow in the morning
Is the shepherd's warning."

"A rainbow at night
Is the shepherd's delight."

"Evening red and morning gray
Are sure signs of a fine day;
But evening gray and the morning red
Brings the shepherd home wet to his bed."

It is a curious fact that the St. Swithin's day proverb has proved quite contrary to recent experience, although taking a series of years the latter part of July is certainly one of the wettest periods of the year.

Again, the proverb "A green yule makes a fat churchyard," embodies a popular fallacy, for statistics abundantly prove that the mortality is always greatest in severe weather.

The principal extremes to which our climate is subject may be classified under the heads of Heat, Drought, Cold, Rain, Gales, and Electrical disturbance. It is worthy of remark that in the central districts of England, more especially in the great valleys, the greatest range of temperature is noticed; the heat in shade during summer being greater, and the severity of frost in winter being also greater in degree. The climate becomes more equable as we approach the coast, particularly on our western side.

THERMOMETER.—We have now nearly completed a century's observations of the readings of the thermometer, and there are tables of daily values showing the maximum and minimum temperatures for every day since the commencement of 1771, comprising about 250,000 records. These were taken at the apartments of the Royal Society till 1840, and afterwards at the Royal Observatory, Greenwich, where they still continue to be made. These have been carefully reduced to standard by Mr. Glaisher. A coloured diagram prepared from these, and now exhibited, shows the monthly and quarterly averages for this period, excess being shaded red, and deficiency of heat in blue. It also shows at a glance, and much more clearly than simple figures, the general characteristics of the seasons. It appears plain from this diagram that our climate has become warmer, the month of January particularly, say from 2 to 3 degrees. There is not so much difference in the summer months, or even of March; but the whole year is somewhat warmer on the average than at the close of the last century.

Whether the increased number of houses and fires in London, or any imperfection in the instruments formerly used may account in some degree for this difference I will not determine. Mr. Glaisher thinks not; and if we are

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o judge from still older records, going back 1,000 years or more, after making all allowance for exaggerations of description, and judging only from the facts well authenticated, there does appear to have existed formerly a much more rigorous climate in these islands than is at present experienced. Probably this arises to a large extent from the clearance of wood and the draining of bogs, not only in this country, but also in Europe, thus allowing the influence of the sun's rays to be more felt, and reducing materially evaporation, and consequently its cold producing powers. It has been attributed to a deviation in the direction of the Gulf stream, which has not yet been proved to have taken place, and for my own part I could never understand how so comparatively small a body of water could influence our climate materially. The prevalence of S.W. winds bringing heat and moisture from the tropics being sufficient independently to account for our warmth in winter.

RECORDS OF GREAT HEAT.

993 and 994—The summers were so hot that corn and fruit were dried up.

1022—Heat most excessive, many men and animals died from it.

1393-1394—Were notable from intense heat.

1447—Very hot summer.

1473-1474—Do. do. "The whole earth seemed on fire."

1646—Was excessively hot.

1679—Do. do.

1702—Do. do.

1717-18-19, 1723, 1724, 1745, 1746—Were all very hot summers.

1750—July 8 to 23, said to be "the most excessive heat ever known"; many people died in consequence.

,, July 11th, thermometer 96°. The previous winter had been very warm.

1778, 1779, 1780, 1781—Four very hot seasons. The year 1779 was hot throughout, and much sickness prevailed.

1802—Was very hot in August.

1808—Was excessively hot in July. On the 14th, thermometer 99° at Ipswich.

1818—Luke Howard says "The clear hot sunshine of the greatest part of this summer had the effect of establishing it in a manner to which we have been long unaccustomed in our climate."

1825—Excessive heat in July; 14th to 19th inclusive, maximum in shade above 90° every day (July 18th 97°). Temperature of the Wye at Ross 81°. This time is still remembered and referred to by residents.

1826—Was very hot.

1834—Hot summer.

1842—Great heat in August.

1846—Intense heat all summer from May 31st to Sept. 23rd. There was a very early harvest and great abundance of corn and fruit. Thermometer

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above 90° in June, July, and August. Like 1750, there had been no previous winter.

1847—The heat of the previous summer was continued to a less extent this year. July and August were very hot, and there was a splendid vintage on the continent.

1852—A very hot fortnight in July in the midst of a wet season.

1856—Beginning of August (July 30th to August 11th) intensely hot. Thermometer above 90° on several days. This was succeeded by very heavy rain, causing the wheat to lair badly.

1857—A very hot summer and autumn.

1858—The hottest June since 1846, and about equal to it.

1859—The hottest July since 1778. The whole summer being similar to the year 1846.

1863-1864—were very fair summers.

1868—Another summer like 1859. Ther. 96°.

1869-1870—Both warm, fine, but not quite so hot as 1868.

It will be seen from the above records that the hot summers often occur in groups of three or four together, and that of late we have had rather an unusual prevalence. They are often preceded and sometimes succeeded by warm winters.

On recalling our past experience it appears, therefore, that there is nothing unprecedented in the hot and dry period we have just had.

RECORDS OF GREAT DROUGHT.

A.D. 763, the summer was so hot that the springs were dried up.

1100.—"The river Trent, at Nottingham, was dry from morning till 3 p.m. for a mile in length, so that it could be passed with dry feet."—*Stow.*

1114.—April 4th, the river Thames was so dry that children waded over between the bridges below London Bridge only knee deep; and it was afterwards dry for two days.—*Stow.*

1276, 1277, 1278.—So hot and dry in the summer that scarcely any fodder could be obtained for the cattle.

1281.—"The drought was so great that men passed over the river Thames dryshod, between Westminster and Lambeth, and over the river Medway, between Strood and Rochester."—*Stow.*

1293, 1294.—Excessively hot and dry.

1345 was called the dry summer, as from March to the end of April little or no rain fell, "by reason whereof corn was very scant the year following."—*Pigott's* "Chester."

1354.—At Nottingham no rain fell from the end of March to the end of July, a period of four months.

1538 and 1539 were excessively hot summers, and the rivers dried up.

1540.—Rain only fell six times from February to September 19th; an exceedingly early spring; cherries ripe at the end of May; grapes ripe in July; middle of harvest, June 25th.

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1541 was another year of remarkable drought. The river Trent diminished to a straggling brook; many thousands died from diarrhœa and dysentry, and much cattle also from want of water.

1556.—The springs failed this year. Wheat rose from 8s. to 53s. per qr.

1591.—An uncommon drought in spring in the midland counties. The Trent and other rivers nearly without water. The Thames also could be crossed on horseback at London Bridge.

1592.—Similar season.

1614.—After a great flood in early spring, drought continued till August, causing great scarcity of hay and corn. Hay 80s. a load at Leeds.

1615.—Great drought throughout Europe.

1616.—"A great drought at Nottingham, by reason of which the country would not afford provisions for Sir Thomas Hutchinson's stables (father of Col. Hutchinson, who was born this year), so that he was forced to remove from Owthorpe to winter in the town of Nottingham."—*Mrs. Lucy Hutchinson.*

1630.—Very dry summer.

1652.—Driest ever known in Scotland, and very warm.

1661.—Derwent crossed dryshod.

1681.—Very dry in Lancashire.

1697.—Very dry in Essex. Rainfall in year, 15·5 in.

1702.—Dry spring and hot summer.

1704 and 1705.—Only about half the average annual fall of rain.

1714.—Probably the driest year of later times. Only 11·2 inches of rain at Upminster, Essex, for the year.

1715 and 1716.—The Thames at London Bridge during a violent gale emptied to a brook 10 or 12 feet over, and people walked on the bottom and found treasures there.

1723.—Very dry year.

1725.—Drier than ever known from middle January to middle April; then very wet till August 27th.

1737.—June 21st, a great drought in west of England.

1738.—In Yorkshire and Rutland, and probably in the neighbouring counties, from August till September 7th.

1740.—Only 1.90 in rain first four months; for the whole year, 17·3.

1741.—Great drought February to May inclusive; for the whole year, 15·7.

1742.—Great drought whole year, 17·3 in.

1743.—Ditto ditto 16·1 in.

1747.—The rivers lower than ever known in Scotland.

1748.—Rainfall, Lyndon, Rutland, 17·2. This year the orchards and oak trees were as bare of leaf as at Christmas. Great swarms of locusts August 4th and 5th in London streets, three times the size of grasshoppers.

1749.—Another very dry year.

1750.—Ditto ditto The first three weeks in July the hottest

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ever known, with very great thunderstorms. On September 2nd, Gloucester streets 3 feet deep in water; large trees and hedges washed away.

1800, 1802, 1803, and 1806, were each of them dry and hot.

1818.—Only 1·41 inches from the 13th May to 5th September, nearly four months; but unlike the present year, it had been preceded by drenching rains in May. An observer, writing after the breaking up, says:—"The rains of this period, though absorbed by the parched ground as a sponge, have completely restored vegetation in our meadows, which have resumed in a few days a verdure equal to that of spring."

1825 and 1826 are still remembered as seasons of excessive heat and drought.

1826. — Pembroke, July 1st. Pembrokeshire and the adjoining counties have not witnessed such an extent of dry weather during the recollection of the oldest inhabitants. Since the 4th of March last but two showers have fallen, neither of which lasted more than three hours. The thermometer during the last week has been ranging from 78° to 83° in the shade. This excessive heat and drought has completely suspended vegetation; the grass lands are burnt brown, the hay on many farms will not pay for mowing, and the corn has but a middling appearance.

1832 was a dry year and a good harvest.

1833.—Very hot and dry May, and a medium harvest.

1835.—Very hot and dry summer; early and abundant harvest. No rain fell from July 14 to August 24th.

1840.—Dry spring and summer till August 17th; very hot in April and August; a good harvest; the crop of hay less than half a load per acre.

1842.—Very dry spring and hot summer; early and abundant harvest and wet autumn.

1844.—Severe drought from Lady-day to Midsummer, with scarcely a drop of rain in Herefordshire for 13 weeks. April was perfect summer for heat and constant bright sun. In a thunderstorm on June 24th a large quantity of rain fell—more than two inches in some places. There was a most abundant wheat crop and well got up, but not very early. Hay was sold at £8 per ton, and some barley never sprouted.

1854.—From March 8th to April 21st unusually warm and bright weather. This year was the driest at Ross for the whole year in the series 1852-1869, only 18 inches having fallen, against about 40 in 1852; the next driest being 1864, with 19 inches, and the average for the last twenty years about 27 inches. The drought, however, was more in the spring and autumn, 4.38 inches having fallen in July, and it was consequently less felt.

1863.—A very dry spring. In the four months, February to May inclusive, only 4.20 inches rain, and in July only ·50 inches. There were however heavy falls in June, and the harvest was supposed to be the best in Herefordshire for many years.

1864.—In the five months, April to August inclusive, only 4.47 inches rain.

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May, July, and August being specially dry. This year there was again a splendid wheat crop in this county.

1868.—This year is so fresh in our memory from the intense heat and drought of June and July that it requires but little mention. The drought may be said to have lasted (for there were only two showers in the interval, one on the 21st June, and the other on the 11th July) from the 29th May till the 6th of August, or 67 days, and this during the hottest part of the year. After a period of heavy rains, amounting to 4.27 inches in 19 days, a second drought set in on the 23rd August and lasted unbroken till the 17th of September, or 25 days.

The total rainfall at Ross for 1868 was nevertheless 29.04, or about two inches above the average.

1869.—In this year, after a dry April and a very wet May, drought set in on the same day as on the previous year, and although not so uninterrupted as in 1868 and accompanied with less intense heat it lasted till the 5th September. During this period of 100 days only 2.45 inches of rain fell.

The total rainfall of 1869 was however more than in any year since 1852, on account of the heavy falls in the early spring as well as in the autumn and winter.

1870.—It may be asked how does the drought of the present year, the disastrous effects of which upon vegetation are daily witnessed, compare with other similar periods. Our persevering observer, Mr. Isbell, will doubtless furnish full details in due time. There is no doubt, however, that from the 8th of February last, till the 22nd August, there was an extraordinary deficiency of rain. This will be seen by the following comparison of the years of smallest rainfall, 1852 to 1870:—

1870.—Feb. 8th to Aug. 22nd—194 days, or about 6 mths. and a half	Rainfall at Ross.	5.30* inches	In the six months.
1864.—March 11th to Sept. 14, 1864—187 days	Rainfall at Ross.	5.60 ,,	
1854.—Jan. 1st to July 1st, 1854	Rainfall at Ross.	6.90 ,,	
1863.—Feb. to May (inc.)		4.20 ,,	In four consecutive months.
1864.—May to August ,,		3.45 ,,	
1868.—April to July ,,		4.58 ,,	
1870.— Ditto ,,		3.56 ,,	
1863.—Feb., March, April		3.32 ,,	For three consecutive months.
1864.—June, July, August		2.74 ,,	
May, June, July		2.70 ,,	
1868.— Ditto		2.37 ,,	
1969.—June, July, August		2.40 ,,	
1870.—April, May, June		2.40 ,,	
May, June, July		2.93 ,,	
1852.—March and April		0.735 ,,	For two consecutive months.
1868.—June and July		0.740 ,,	
1865.—September		0.07 ,,	Driest single month.

* Of this amount 1 inch fell in the first 4 days in March; 1 inch from the 10th to 13th May; and nearly 1 inch in a heavy shower early in July. There were heavy thunder storms during July in places, but very local and partial; and there was scarcely any rain besides.

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It will be seen from the above that 1870 is the driest year for twenty years as regards six consecutive months—although 1864 is very similar. For four consecutive months 1864 is about the same. For three, 1868, 1869, 1870, are equally dry, and for two summer months 1868 is unequalled. September 1865 being the driest month during the 19 years. It will be also gathered from the records quoted that drought has been by no means uncommon in England, and it is satisfactory to notice that on the whole it is not injurious to our corn harvests.

It may also be remarked that for the last four years the month of June has had only one-fourth of its usual rainfall. July has been likewise greatly deficient since 1862—except 1867—so that it is fair to conclude that wetter summers may be in store for us than those we have had lately.

RECORDS OF GREAT COLD.

FROSTS, &c.

A.D. 220—A frost in England lasting five months.

230 or 250, and 695—Thames frozen over for six weeks.

291 329—Most English rivers frozen over for six weeks.

359—Fourteen weeks' severe frost in Scotland.

508—All the rivers in Britain were frozen up for above two months.

759—A great frost in England from October 1, 759, to February 26, 760.

827—Great frost for nine weeks.

874—Snow from November to the end of March.

908—Most English rivers frozen for two months.

923—Thames frozen for thirteen weeks.

987—Frost began December 22nd, and lasted 120 days.

991-998—Both severe winters.

1035—Frost on June 24th, destroying corn and fruit.

1063—Thames frozen over for 13 or 14 weeks.

1075-1076—"Severe from November to April."—Saxon Annals.

1093—Mills and bridges carried away when the ice thawed.

1114—Same thing happened.

1125—Very severe.

1205—Frost from January 14th to March 22nd.

1281—"Thames frozen over. Five arches of London bridge carried away."—Stow.

1407—Frost in England, with deep snow, for fifteen weeks. This year the sea was frozen between Norway and Denmark. In France the vineyards and orchards were destroyed, and the Danube was frozen over.

1432-3-4—Uncommonly severe winters in England and Europe. Wheat rose to 27s. per quarter from about 5s. The river Thames was frozen from below London Bridge to Gravesend from November 4th, 1433, to February 16th, 1434.

1506—Thames bore carriages throughout January.

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1515—Ditto ditto from Lambeth to Westminster.

1534—Thames frozen some miles from Gravesend.

1547—Intense frost.

1564—"Thames solid as a rock." Queen Elizabeth was daily on the river. Football played on the Dee at Chester. The sudden breaking up caused great inundations and destruction to bridges, houses, and vessels.

1580—Very intense frost.

1586— Do.

1607-8—"A greate froste snowe began the fyfte day of December," and continued till February 14th, 1608. Fires on the ice on the Thames in the first week of December. Horses crossed the Ouse at York on the ice. Wheat nearly doubled in price.

1615—Immense falls of snow in Derbyshire, lasting from January 16th to May 28th, said to be four feet deep on the plain and drifts covering hedges, walls, and gates so that horses and men passed over them.

1620—Thirteen days' snow on Eskdale Moor, only 45 sheep were saved out of 20,000.

1658—Intensely cold causing great rise in the price of wheat.

1662—Thames partially frozen over end of November.

1664—Frost till the beginning of March.

1683-4—Frost said to have commenced September, 1683, and continued without intermission till February 5th, 1684. Fearful destruction of trees and plants in the beginning of December. Great oaks as well as other forest trees split with the noise of the report of a gun. Yew, holly, furze, were killed, but not broom. Ice eleven inches thick on the Thames on which forty coaches plied for hire. Temperature January 5th, London 8° below zero. Birds nearly all perished. It was said at the time to be the longest frost on record.

1688—Thames was again frozen in January.

1694-5—Seven weeks' frost in London.

1697—Severe frost.

1698—Much ice and snow—in April, very deep on the 3rd May. On May 15th the woods were like winter. It was the most backward spring for 47 years. "No gooseberry tarts till July."

1708-9—Called by distinction, "The cold winter." It lasted from December, 1708, to March, 1709, and was very severe in the south of England and Europe, but scarcely felt in Scotland and Ireland; the coldest day, London, was January 3rd. Thames full of ice, but not solid like 1684. It was very severe, however, in North Germany and the Baltic. On May 4th, 1709, there was ice in Copenhagen harbour 27 inches thick.

1715-16—Frost, Nov. 24 to Feb. 9. 1716—During the whole time the Thames was frozen over; in January, strongly so. Booths were erected and fairs held on the river.

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1739-40—A great frost began Dec. 24 and lasted nine weeks. Lowest temperature, Jan. 3rd, 11° Fah. An ox was roasted on the Thames, and a printing press on the ice as far down as Queenhithe. Oaks were riven with the frost. Ice 10½ inches thick. This frost was preceded by a very wet season.

1771—Severe weather lasted till the 20th of April.

1776—The snow lay for 26 days on the roofs of houses in London.

1784—December extremely cold, with much snow.

1788—The coldest December within the last hundred years. An old gentleman, lately deceased, remembered a running stream frozen hard that year.

1795—January of this year was the coldest month since the year 1771, up to the present time (1870). Its average temperature was less than 24°. An old man, born in 1778, and now living, remembers the ice in the Wye, at Ross, where the boats start from, being measured 1 foot thick. The floods which followed the breaking up of this frost, were so great that large numbers of bridges were carried away. The Wye rose higher by 18 inches than it has since done, and at the time, was said to be higher than ever known.

1799—In March the snow-drifts were so great as to be distinctly remembered by old men, now living at Ross, and a large mass, blown up against the bank and trees where the Prince of Wales inn now stands, remained unmelted for a long time after.

1813-4—The twelve weeks frost, as it is still called, which began December 27, 1813, and lasted with slight intermission till March 20, 1814, was the last time the Thames was frozen over to bear thoroughly well. The rebuilding of London bridge will make such a thing unlikely again. In that season you could travel on sledges over the hedges for miles—from Ross to Gayton Hall for instance.

1819-20 and 1829-30 were both severe winters—the latter especially so in France and Italy.

1837-8 was the next frost of long duration, and is called Murphy's frost, from his almanac which was then published. January was very severe, and the cold continued till near the end of April. The season was very backward, the previous spring having been even more so, from great snows in April and May.

1844-5 was a long and severe winter, chiefly remarkable for its intense frosts in March. It was said to be the coldest for forty years. But the same thing was said two years later.

1846—The ice was six inches thick in the canals of Herefordshire before Christmas. The month of December was very severe in 1840, 1844, and 1846.

1855—We come now to the last great frost of long continuance. February, 1855, was colder than any other February since 1771. This frost began about the middle of January, and lasted nearly six weeks. Most of the rivers in England were frozen over—the Thames amongst the rest. The Wye bore all over for a fortnight, and a waggon even crossed it at Hoarwithy.

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1858.—There was a very cold period from the 6th of February to the 12th of March; and again from the 28th October to the 24th November, the temperature being 6° below the average during the whole time, and the 23rd and 24th November being the two coldest consecutive days in November for 45 years. There was scarcely any winter after, thus verifying the old proverb.

1859.—There was an extraordinary defect of temperature from October 21st to October 31st, being as much as 15° below the average on the 24th, and nearly as much for some days. Another cold period set in on November 9th and continued, with the exception of a very few days, till December 23rd. The cold was excessive from the 16th to the 19th December, 15°, 17°, 16½°, 15½° below the average. The range of temperature was also very great in the months of October and December, it having been above 80° in London and many other places in October, and down to 19° at York in the former month, and in December varying from 2° at Lampeter to 64.8° at Osborne.

1860.—This was an exceptionally cold year, with great deficiency of sunshine and large excess of rain and cloudy cold weather. Christmas day was memorable for its intense frost. On the surface of the snow at Ross the thermometer registered 10° Fahrt., and in 78 stations in England it was also noticed below zero. This coming rather suddenly after warm weather (on the 7th it was 54° and there had been no severe frost till the 18th) was very destructive to evergreens, shrubs, &c. Laurels and laurestinas were killed down to the ground, as they were in the winter of 1838. A very large evergreen oak, at least a hundred years old, in the rectory garden, Ross, was apparently destroyed; it has since partially recovered. The cold was again nearly as great on the 29th, after which, there was a rapid thaw for two days, but the frost set in again in the beginning of January, and continued very severe till the 19th. The first half of January being colder than for 41 years—1814 and 1820 having been each slightly more rigorous.

1864.—There was a severe frost until January 9th, the ice on the sides of the river Wye bearing firmly. Very fine weather had continued for weeks all over the country to the end of 1863 (Christmas day was like a summer day), and the sudden change to severity proved very destructive to garden vegetables—celery, brocoli, and lettuce were mostly killed. The ground was frozen to the depth of 15 inches.

1865.—The first three months of this year were remarkable for large snow falls—snow falling at one or other parts of the country for 81 days in the quarter—on the 27th January the snow was eighteen inches deep on the level at Leominster, decreasing to about a foot at Ross, and in hilly districts drifts 6 or 8 feet deep occurred in places, being the heaviest fall for many years. The month of March was colder than any since 1845, the only other instances as cold this century being in 1814 and 1837.

1867.—January 4th, an intensely cold day. In London, Hampshire, Surrey, &c., very deep snow. Traffic much impeded. Trains stopped for hours

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near Bangor. Temperature lowest in the neighbourhood of London, where there was a more severe frost than in 1860—but not so in Hertfordshire or the country generally. Lowest temperature recorded –12° at Epsom, whilst at Ross it was not below 9°. March was very cold, easterly winds blowing uninterruptedly from February 26th to March 25th.

We gather from these records that severe frosts in winter, such as in December, 1860, only occur a few times in a century.

Frosts of long continuance like 1794-5, 1813-14, 1838, and 1855, are also not frequent, nor yet heavy falls of snow in this part of the country.

Really cold and wet summers are still less often experienced, only three having occurred in the hundred years—viz., 1799, 1816, and 1860.

The thermometer in most years at some time or other descends to 15°, although in exceptionally warm winters, such as 1852 and 1863, its lowest was 25°.

RECORDS OF GREAT RAINFALL, FLOODS, &c.

The rainfall of this district has been measured and recorded for 52 years or since 1818, and it appears that we have an average annual fall of about 27 inches. This is more than that of the eastern counties or even London, but considerably less than Monmouthshire or Radnorshire, or the shores of the British Channel. During a prevalence of south-west winds we often have more rain in the south than they have in the north of the county, while I suspect that thunderstorms are more frequent in the north. The heaviest falls of rain are generally accompanied by thunder and lightning, but occasionally we have a steady downpour without it.

I propose to give a few instances of years in which there was an excessive amount.

353.—A great flood in Cheshire; 5,000 persons, besides large numbers of cattle, said to have perished.

738.—More than 500 families drowned at Glasgow by an inundation.

836.—Country for 30 miles round laid waste by river Tweed.

1015.—Great inundation of the sea.

1091.—Nov. 6, London bridge swept away.

1099 or 1100.—Godwin's Lands, 4,000 acres (now called Godwin's Sands), first overflowed by the sea.

1408.—Ware greatly damaged by a flood.

1439.—A great flood in Lincolnshire.

1483.—In October the river Severn overflowed for seven days. Men, women, and children carried off in their beds. Called the "Great Waters" for a hundred years after.

1517.—November 27, great flood on the Trent at Burton.

1528.—Incessant deluges of rain prevented grain being sown, and there was consequently a great failure in the harvest.

1600.—Great flood on the Trent, which altered the course of the river near Newark.

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1607.—In Somersetshire and Gloucestershire about one hundred persons perished from the inundations.

1614.—Flood in Yorkshire after the frost broke up.

1669.—August 18, a great torrent from Pendle Hill, floating the furniture about in the houses.

1672.—December 23rd, great flood on the Severn; height still marked at Worcester.

1674.—Another great flood on the Trent, May 7 and 8.

1683 or 4.—February 5 and 6, very destructive floods in midland counties. Bridge over the Trent at Nottingham destroyed.

1686.—June, a mountain flood in the "Craven" district, Yorkshire, nearly destroying two towns.

1689.—Incessant rain, with the exception of a few hours, from October 1 to 10th, causing a great flood in Norfolk, and breaking down bridges at Bungay, in Suffolk.

1698.—August 6th. Excessively wet summer from May. Whole fields of corn spoilt.

1703.—Very wet September to November.

1706.—Prodigious flood in the North of Ireland, October 7.

1707.—Ditto, in July.

1709.—Great flood after thaw.

1725.—Cold and very wet from middle April to August 27th.

1735.—Inundations general throughout England after a gale, on January 8th. September 7, greater flood at Coventry than for 40 years.

1736.—July 5, highest tide in Thames for fifty years. March to July continued rains—in three days 5 inches fell. "The damage done almost incredible."

1737.—Jan. 9, the damage in Bristol from gale and flood £100,000. Water rose 70 feet at Chepstow, and within 4 or 5 inches of the November storm of 1703.

Sept. 28 to Oct. 3 heavy rains, causing great floods in the Eastern counties.

1738.—Jan. 2, another severe storm at Bristol.

1749.—August 22, the most remarkable storm remembered at Keswick, Cumberland.

1750.—Sept. 2, streets in Gloucester three feet deep in water from three hours' violent rain.

1752.—Dec. 30, coaches stopped by flood between Bristol and Oxford.

1753.—Feb. 15, great floods in North of England from sudden rain melting the snow.

1768.—A remarkably wet year and bad summer.

1770.—Nov. 18th, highest flood on Severn at Worcester and Gloucester between 1672 and 1870. There is a brass plate marking its height at Worcester on the steps leading to the Cathedral, which shows that it was 10 inches higher than the memorable one of Dec. 23, 1672. It was caused by three days' heavy rain, and its effects were terrible all over the country, Carlisle, Cheshire, and the Bedford level being recorded, amongst other places, as having suffered

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greatly. At Bridgnorth the water was two feet higher than any flood remembered, and also at Gloucester. Two houses were carried away at Tenbury.

The rivers Wye and Lugg were also so much flooded as to stop the coaches. A bridge at Mortimer's Cross was carried away. The London waggon was thrown off the causeway at Wilton-bridge, near Ross, and to quote the quaint words of the chronicler, "It is pleasant to reflect that the passengers were all got out before the accident happened." People were drowned both at Monmouth and Brecon.

1795.—Feb. 11th, this extraordinary flood, which was so disastrous throughout England, and which is still remembered by a few old people, and not unfrequently referred to even now after the lapse of 75 years was caused by a sudden thaw after a more severe month's frost than we have since had.*

The Wye attained its greatest height at Hereford on Wednesday evening, at six o'clock, February 11th, at which time it was said to be two feet five inches higher than ever known by the oldest resident. The inhabitants beyond Wye-bridge had to be supplied with food by boats. At the village of Hampton the water rose six feet in half an hour. At Lugg-bridge the road was so broken up that it was impossible to pass after the flood had subsided. All but the strongest built bridges were washed away. Amongst the rest Glasbury, Whitney, and Hay. A farmer, of the name of Lloyd, of Clyro, was crossing Hay-bridge at the time and was drowned.

Buildwas, Bewdley, Stourport, Uxbridge, Long, and many other bridges on the Severn were broken, as well as Ashford bridge on the Teme at Ludlow.

Ross and Monmouth bridges were said to be much damaged. R. Crowder, grocer, at Monmouth, was drowned in the Chippenham meadows where he had gone in a boat to rescue some property.

The middle pier of Usk bridge was carried down, but the arches left standing.

At Shrewsbury the Severn was higher by several inches than in 1770, and consequently than ever known, but it is rather singular that at Worcester it did not reach the height of that flood by 7½ inches.

At Gloucester it was said to be the highest since 1770. Again the highest point was reached at Shrewsbury 22 hours before at Worcester, when it was four in the afternoon of Thursday. At Gloucester St. Mary's-square and the County Prison were quite surrounded with water.

At Shrewsbury the timber merchants were said to have lost £1,000, and an immense number of cattle, sheep, pigs, &c., were lost.

Three men driven against the pier at Chepstow bridge while out in a boat were drowned.

1799.—Feb. 20, owing to heavy rains and quantities of snow, which had completely stopped the traffic on many roads in the kingdom, the river Wye rose higher than since 1795.

* See Records of Cold.

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1799.—August 21, "The greatest flood on the Wye, Lugg, and Teme ever known in summer," washing away the hay and corn out of the fields, and so adding to the losses of that disastrous season when wheat was 30s. per bushel.

1809.—January 27, the melted snow and rain, amounting to about two inches in depth on level, descending suddenly by the rivers, inundated the country to as great an extent in some districts as in 1795. The Wye was, I believe, 18 inches lower. The Thames was so full that no tide was perceptible.

1816 was a very wet, cold season. Wheat out at Christmas, and the head so bad "that it would stick if thrown against a wall." The season said to be as bad as in 1698.

1824.—This was a very wet year. The Wye was flooded in November, and rose nearly to the height of 1795. The coach could not cross the causeway at Ross, on November 25th.

1828.—Great rains every day, from July 9th to August 15th. August 14th the great harvest flood in Suffolk.

1829.—Rain more or less (except on four days) from June 16th to Sept. 20—ninety-six days. Bad harvest, and much corn injured. Unparalleled floods in the North of Scotland.

1830.—A very wet June. The Wye overflowed its banks, destroying the crops of grass and corn which grew there. In Warwickshire, Shropshire, Derbyshire, and Worcestershire, as well as further North, inundations were very extensive. Some farmers having lost their hay crops for three consecutive years by floods.

1831.—Feb. 10, great flood on the Wye and Lugg from thawed snow. Higher at Ross than at any time since, and only about one foot lower than in 1795. Said to be not quite so high at Hereford as November, 1824. The coach was left in the Old Wilton Road, and the market women brought their wares into Ross (being market-day) in boats. A man named Charles Brain was drowned whilst out in a boat.

1836.—November, great flood in Lugg, about same height as in 1831.

1839.—July 31, Lugg and Teme higher than ever known in summer. Severn also very high.

1852.—This year, the last very wet year we have had, was remarkable for two most extraordinary floods, the one on February 8th, the other on November 15th.

The former was rather the highest on the Wye and the latter on the Severn, reaching at Gloucester within one inch of 1795, whilst the Wye at Ross was as much as 18 inches short of the same mark, and no flood has since approached within about two feet of the same height. The bridge over the river Froome was washed away, and the mail coach drove into the chasm, causing Mr. Hardwick's death by drowning. The great depth of water in houses and over roads, and the expanse of country covered with water, are all fresh in memory.

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1858.—There was an extraordinary rainfall at Ross on August 13th, such as only occurs in one place in a long period, 3.84 in. of rain falling in the day, out of which nearly 3 in. fell in 50 minutes! The lower streets were three feet deep in water, and the roads so washed up as to look as if newly stoned.

1860.—Very wet June and August. Wettest year since 1852.

(N.B.--The Record of Gales and Electrical Disturbances will be given at the Annual Meeting. See page at the end of this volume.

The meeting was attended by the following ladies and gentlemen: Dr. Bull, the president for the day; Sir Geo. H. Cornewall, Bart., honorary secretary; Dr. Wright, F.R.S.E., F.G.S., and vice-president to the Cotswold Naturalists' Field Club; Richard Hereford, Esq, Miss Hereford, and Miss Alice Hereford; the Rev. Jas. Davies, Moor Court, and Mr. J. H. Davies; the Rev. Thos. Phillipps, Mrs. Phillipps, Mr. J. Phillipps, Miss Phillipps, and Miss Penelope Phillipps; John Lloyd, Esq., and Mrs. Lloyd; Dr. Chapman, Abergavenny; Rev. R. H. Williams; Mrs. Jones, Mount Craig, Miss Eckley, and Miss Fanny Eckley; Arthur Armitage, Esq., and the Rev. J. J. Pegler, Knighton; Thomas Cam, Esq.; the Rev. A. G. Jones and Miss Jones; the Rev. John Goss, Mrs. Hanbury, Miss Rudd, and Miss Taylor; James Davies, Esq., Mrs. Davies, and Miss Davies; Capt. Manly Power; T. Curley, Esq., F.G.S., and Henry Haywood, Esq.; W. Wellesley, Esq.; Rev. W. S. Stanhope; John Lingen, Esq., and Miss Lingen; the Rev. H. W. Tweed; the Rev. Bernard H. Marshall, Mrs. Marshall, and Miss Matthews; the Rev. E. J. Owen; J. Griffith Morris, Esq., and Mrs. Morris; Miss Fox, Birkenhead; Dr. Jones, Ross; R. Vassar Smith, Esq., and Miss Smith; Alfred Purchas, Esq., and Mrs. Purchas; Thos. Blake, Esq.; Mr. Henry Southall; Mr. John Pitt, Miss Pitt, and Miss Griffin, Hartlebury; Miss C. Thompson; Mr. Price and Mrs. Price; Mr. Thomas Adams; Mr. Henry Hall; Mr. Douglass; Mr. R. W. Watkins, and Mr. Arthur Thompson.

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The Woolhope Naturalists' Field Club.

LLANGORSE LAKE AND THE ALLT.

FRIDAY, JULY 22, 1870.

Llangorse Lake, Llyn Safaddu or Safeddan, or Brecknioc Mere as the fancy of the reader may please to term it is one of the wonders of Wales, according to Archdeacon Mape in his Poem, "De mirabilibus Walliæ." It is the largest Lake in South Wales, about two miles long, five miles in circumference, nearly a mile broad at the widest part, and covers an extent of some 1700 or 1800 acres. It's position at the foot of the Black mountains, on the extreme western side, rendered it very unapproachable until the advent of railways. Now, however, the Hereford, Hay, and Brecon line passes near, and an hour and a half's ride and a pleasant walk of a mile from the Tal-y-llyn Junction-station brings it within ready reach of visitors from Hereford.

It forms a very pleasant excursion and will be the more appreciated the better it is known. On the first approach the Lake does not seem large, but the extent of its waters becomes more and more evident as the boat makes progress on its surface; and so too does the beauty of its scenery. From every position about it the mountains Myndd Llangorse, and Myndd Troed look bold and well, and are ever enriched by the deep shadows of the passing clouds. It is said that the Black Mountains take their distinguishing name from the depth of the shadows thrown on them in this way, and certainly it is remarkable as seen from the surface of the lake. On the southern shore, the fine hill the Allt, with its wooded slopes shelves down to the flat meadows on the margin. About the middle it forms a low promontory on which stands the little picturesque church of Llangasty Tal-y-Llyn, and the lake bends suddenly round it. Destitute indeed of all artistic feeling must the visitor be who does not admire the beauty of the scene, as the boat returns, when the little church appears on the left, charming groups of Scotch fir trees in the meadows, with the near hills surmounted by the Brecon Beacons, which are most beautifully seen. What lovely sunsets are to be enjoyed upon the Lake, what calm and beautiful early mornings, those only know who have experienced them.

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The variety of water fowl that frequent the Lake, the rarity and beauty of its wildflowers, and the abundance of its fish, all form special objects of interest. And in addition to all this the Lake is peculiarly rich in legendary lore, and has an artificial Island of its own—a lake dwelling of some former period, and beneath its waters lies hidden a buried city, whose houses and terraces and gardens are visible to the faithful at certain times.

The Woolhope Club visited Llangorse Lake on Friday last. The members left Hereford at 9·35 a.m., and got back again with the 7·35 train in the evening, having spent seven hours there as agreeably as might be, considering the heat of this extraordinary summer.

The ride there was beautiful as it ever is along the valley of the Wye, but the very sight of the river, with its shallow streams, and long gravel beds exposed to the glaring sun, was enough to create a feeling of compassion for the poor salmon imprisoned in the pools. Fish and fishermen all cry out for rain, as much as does the thirsty soil, for if freshes and floods do not come at their accustomed times, the fish are unable to leave the estuaries for the rivers and the fresh-water fishermen, gentle and simple, are thrown out of employ. The present fishing season on the Wye is, indeed, a remarkable failure. Few can remember a drier spring, or consequently such very low water for so lengthened a period. The facts are most inauspicious, and whatever may be the ultimate result of the care and labour bestowed on the Wye fisheries, in such a season as the present it is impossible to look for a successful result. No benefit can possibly be derived by fresh-water fishermen when the water itself fails and the fish cannot come up the river. Nor does it mend the matter in their eyes to learn that those who lease the fishery at the river's mouth are having a prosperous season.

By the kindness of the railway authorities the train set down the visitors at the old Tal-y-llyn station, and a pleasant walk of a short mile through the flat green meadows brought them to Llangorse common and Mr. Pritchard's boats.

As the lake and its legends, its island, its scenery, its occupants, and its history, so far as may be made out, are dealt with in two of the papers read before the Club, it will be only necessary now to give a brief record of the Club's proceedings during the day.

The Lake was crossed to Llangasty Tal-y-llyn Church, and whilst the majority of the members ascended the Allt, the remainder visited the church itself—a very model of a church, for its rich and careful decoration. The official members of the Club went up the ridge of the hill, and hot indeed was the walk. The beauty of the scenery was nevertheless greatly enjoyed, and none will regret the cost of its pleasant recollections.

On the summit, business was immediately proceeded with. The Rev. C. C. Walkey and Mr. J. H. Davies, of Moor Court, were elected members, and several other gentlemen were proposed for election at a future time. An able paper "ON THE LANDSCAPE OF THE ALLT" was then read by John Lloyd,

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Esq. The descent was made on the steep side of the hill, through the brake, the nut-bushes, and the trees which clothe its sides, to Mr. Raike's boat-house. A long row down the Lake to its island, the Ynys Bwlo, was then made, under a sun of about 130°. This was an especial object of interest in the day's excursion. A very interesting paper "ON THE ISLAND IN LLANGORSE LAKE AND ITS PROBABLE ARTIFICIAL ORIGIN," by Henry Dumbleton, Esq., was then read, and Mr. Dumbleton pointed out the ends of the stockade of piles which are still to be plainly seen and exhibited other articles of interest which had been found there. Indeed on examining the island closely its artificial origin seemed beyond dispute. The paper and discussion which arose upon it will be given at length.

Another paper "ON PLATYPUS CYLINDRUS" a Xylophagous beetle, by Dr. T. Algernon Chapman, was then read, and the boats were again taken for Mr. Pritchard's house, on Llangorse Common, where a tea dinner had been provided.

Several objects of interest were exhibited here; a very fine horn of the red deer, which had been brought up by a fisherman's net from the bed of the lake about thirty years ago. It belongs to Mr. Perrot, of Llangorse, who kindly sent it for exhibition,—with a cannon ball some 18 or 20 lbs. weight, which also came from the lake bottom.

W. H. West, Esq., brought some very fine stone implements—celts—found by Archdeacon Davies, at Court-y-gollen, which created much interest from the perfection of their shapes. Only one was of flint, the others were made from a hard limestone.

A leisurely walk was now taken for Tal-y-Llyn Station to meet the train, and thus ended an agreeable meeting in which all the arrangements were pleasantly and successfully carried out.

The following gentlemen attended the meeting:—The Rev. W. C. Fowle, M.A., President for the day; the Rev. Arthur Gray, and James Rankin, Esq., M.A., Vice-presidents; John Edward Lee, Esq., F.G.S., Caerleon; Henry Dumbleton, Esq., Hall Grove, Bagshot; Dr. M'Cullough; Arthur Armitage, Esq.; the Rev. Thomas Phillips, and Mr. Jacob Phillips; Dr. Bull; the Rev. C. J. Robinson; John Lloyd, Esq.; the Rev. C. Griffith, Glyncelyn; Thomas Cam, Esq.; the Rev. C. Hornby; W. H. West, Esq., Gliffaes; the Rev. W. Jones Thomas; T. Curley, Esq., F.G.S.; the Rev. J. E. Bruxner, Leicestershire; Col. Bridgewater, Coitymawr; the Rev. E. J. Owen and E. C. Bond, Esq.; James Phillipps, Esq.; J. Mortimer Bowen, Esq.; the Rev. J. H. Jukes; the Rev. T. M. Beavan; E. J. Smith, Esq., Hay; James Davies, Esq.; F. George, Esq., M.D.; the Rev. T. T. Smith; Robert Cowtan, Esq., London; J. E. Thomas, Esq., F.G.S., Hay; Alfred A. Langley, Esq., Hereford; W. A. Swinburne, Esq., Cusop; C. G. Meredith, Esq., Exeter; E. B. Marsden, Esq., Cardiff; the Rev. G. H. Clay, Kington; Mr. Harman; Mr. J. E. Morley; Mr. James W. Lloyd; Masters Ernest, Alexis, and Henry Bull; and Mr. Arthur Thompson.

The following papers were read:—

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THE LANDSCAPE FROM THE ALLT.

BY JOHN LLOYD, ESQ.

There is a time-honoured toast in Shropshire, "All friends round the Wrekin"; to-day it may be aptly applied to the Allt, but the "friends round the Allt," whose acquaintance I wish you to make to-day, are places—not people.

The view from the Allt, as you see, is remarkably fine. Whether we look north or south, east or west, a varied expanse of mountain and valley is before us. Whichever way we turn, all that is required to make scenery perfect, mountains, woods, river, lake, and smiling valleys, all are present.

The ridge of the Allt, up which we have just come, called the Pennorth ridge, is remarkable as forming the water shed of the two rivers the Usk and the Wye. On the one side, to the South, the streams flow into the Usk, which you see immediately beneath you, winding gracefully like a silver thread through the luxuriant vale; whilst those on the northern side flow into the large, deep-shadowed lake of Llangorse or Llyn Savaddan, and thence by the Llyfni stream into the Wye. At this point the sister rivers are nearer to each other than anywhere else.

The Wye, says Giraldus, has its source on the Ellenith Mountains; the Usk on those of Cantreff Bychan. The latter river flows by the Castle of Brecheinioc, or Aberhodni, that is, the fall of the Hodni into the Usk (for Aber in the British language signifies every place where two rivers unite their streams), by the Castles of Abergavenni and Usk, through the ancient city of the legions (Caerleon), and discharges itself into the Severn sea not far from Newport.

Our position to-day being in the centre of Breconshire, a county,

Where worshipful mountains so solemnly stand,

we may pay homage to the numerous streams which flow down their sides, and attest the truthfulness in part at least of the description given of them by Michael Drayton:—

"Brecknock long time known a county of much worth,
Unto this conflict brings her goodly fountains forth,
For almost not a brook of Morgany or Gwent,
But from her fruitful womb do fetch their high descent,
For Brecan was a prince once fortunate and great,
Who dying lent his name to that his noble seat,
By twice twelve daughters blessed by one and only wife,
Who for their beauties rare and sanctity of life
To rivers were transformed, whose presence doth declare,
How excellent they were by being what they are."

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On either side of the great ranges of mountains before us rise these numerous rivers. The "Ebwth," "Srwy," "Remny," the Taffe "as gray as any glasse," the sweet "Melta," "the cleer Hepsey," "the nimble Neath," and the Tawe flow from them southwardly through Morgany, or Glamorganshire. In the centre of the county is the "sprightly Uske," with her attendant handmaids, Crai, Senni, Cilieni, "Camlas," "the tripping Breane," Isker, "Hodny fine and cleere," Cynrig, Tarell, Mehascin, Cavanell, Crawnon, Rhiangoll, Onney, "the Grony" and "Cledaugh." The Carmarthenshire Towy, with its tributaries, the Sawdde and Gwydderig drain the extreme western end. Northward, on the boundless waste of Drygarn, the Irvon, Wye's finest tributary, rises, and on the slopes of Epynt, and near the height of Penygorllwyn many of its affluent streams. For nearly forty miles of its course the Wye itself is the boundary of the county. Eastward we have the Llyfni, and he tributaries, the Dulas, the Enig and the Frwd, and on the farther side of the range of Black Mountain rises the Honddu. All these last named streams hasten their course to the fertile fields of Hereford and Monmouth, or the land of Gwent. There would be little difficulty in finding within the county representatives of Prince Brechan's daughters, for there is no other county in England or Wales that has so great a number of rivers and brooks in proportion to its size.

Turning first to the eastward, and looking across the Lake of Llangorse, we see the great frontier mountains of Breconshire, the Black Mountains of Talgarth and Ewyas. These mountains derive their sombre title from the deep shadows, which the passing clouds throw across their giant sides; they embrace the parishes of Talgarth, Llanelieu, and Llanigon, and several of their outlying ribs stretch far into the pleasant valleys of Monmouthshire and Herefordshire. On our extreme left, and constituting the chief feature of the view from the lake is Mynydd Troed, thus called, since it can only be ascended on foot. The most elevated point of this range of mountain, rising between the double head of "Grony," is called Y Gadair, and excepting the Brecon Van is the highest mountain in South Wales. The Brecon Van can boast of being Arthur's Chair, but thou :—

"Magnificent Gader! it is lost to story,
Who of the famed colossal chiefs of old
Upon thy mountain summit loved to hold
His throne, seated apart in mystic glory.
The gray mist round him wreathed a mantle hoary."

The Gader can be seen from nearly all parts of Herefordshire, and often when looking at its flat head, thrust, as it were, above the adjacent mountains,

"I do feast upon thee with mine eyes,
Though hard at first amid that lengthened chain
To find, when found, thy sovereignty how plain!
Thou art there amidst the silent skies."

The Black Mountains are now a valuable and peaceful sheep walk for neighbouring farmers. Time was when they were valued by the Welsh, and subsequently by the English, as barriers to their foes. Except by the gorges of

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the Usk at Buckland, and of the Wye at Hay, no road was open unless over these mountains, and hence the greatest pains were taken to protect the only practicable passes over them, those at Penycenffordd and Bwlch. The castles of Hay, Clifford, and Brynllis defended the approach by the Wye valley, and Blaenllyfni Castle, close beneath us, protected the pass at Bwlch, and with its dependent castles of Tretower and Pencelly, the valley of the Usk. Dinas Castle protected the great pass at Penycenffordd, and thus with garrisons placed at each of these points, all access from Breconshire to and from Herefordshire and Monmouthshire was cut off.

Another mouldering castle bids us think of days gone by, when the great Norman barons made their first incursions into Wales, with their own retainers and on their own account. The great battle near Brecon, in which the Welsh under Bleddin ap Maenach were defeated, placed the whole of Breconshire in the power of the conqueror, Bernard Newmarch. The King assigned to him the conquered lands, and he in turn sub-divided them among his knights and followers. Bernard Newmarch built his chief castle at Brecon, and founded the present town. Probably, too, at the first leisure time, he commenced the building of other castles, the better to overawe the Welsh, and as residences for his chief followers.

Blaenllyfni Castle was among this number, and it not only served these purposes, but it was very valuable as a half-way post to England, and to protect the pass of Bwlch and the Vale of Usk.

Many of the old historians wonder and exclaim against the folly of those who built a castle in such a place. Jones says, "It cannot be conceived or ascertained what could induce a person to build a castle in such a low situation, surmounted by heights on all sides except one." It may be said, however, in favour of its site that it was close to the pass, sheltered from observation, and, with its deep moats around it, formed a very secure defence. The tiny stream of the Llyfni was diverted far up the mountain side, and brought, as it is to this day, to supply the moats.

Blaenllyfni Castle has had various possessors, and was usually held with that of Dinas. The Lord of Goodrich Castle in Herefordshire Gilbert Lord Talbot, in 1346, was one amongst the number. There is still a considerable portion of the old castle left, and the moats are almost perfect. The latter are now used as a reservoir for the adjacent saw mill, and the enclosure of the castle is thickly planted with young larch trees. An old town is said to have existed near the castle some time since. Of its real history there is but little known. Leland's reference to it is as follows:—"In sum ancient writings this castell was called Everi Castel, and Lleveni water called Everi brooke. The house of Blain Lleveni standing in a valley ys in the Walshe Talgarth, where is yet the shape of a veri fair castel now dekeiyng, and by was a borow town, now also in decay, both longged to the Erle of Marche. Though Blain Lleveni be in Walshe Talgarth, yet the tenauntes keep the Englishe tenor."

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To the right of the castle, and over the pass of Bwlch, we look down upon the valley of Cwmdu, and of the Usk as far as Abergavenny, the Sugar loaf and Blorenge mountains hemming in the valley on either side.

Farther to the right is Buckland hill, or Mynydd Buckland, overhanging the course of the Usk. The fine larch and Scotch fir woods in the foreground were planted by the late Col. Holford, whose house is on the slope of the hill. They are said to be arranged in the same form as the troops were drawn up at the battle of Waterloo.

What do you ask throws this dark shadow across the valley of the Usk? The valley has changed into a glen! On one side Buckland hill shuts out the morning sun; on the other the black beetling brow of Tar-y-foel, towering with its giant form to the sky, shelters the river from the noonday heat. Thus is formed the gorge of the Usk! Here we can readily believe until the river had made its present deep channel the waters of the Usk were pent up above, until they extended in a vast lake far up the valley. Beyond Tar-y-foel rises the massive Llangynider mountain, interesting only for the mineral wealth it contains. At Penrhiwcalch, and other points we catch glimpses of the limestone rock, which fringes the South Wales coal basin. Still to the right opens the picturesque valley of the Cavanell, called Glyncollwm, or the valley of hazel bushes, up which the Brecon and Merthyr Railway creeps. Few Breconshire people thought it possible to make a railway through or over their grand old mountains. They had ignored the existence of this secluded valley, which nature had, as it were, formed to suit the engineer's hand.

Beneath our feet on the banks of the Usk is the grotesque beehive-like tower of the quaint little church of Llansaintfread.

> "And well did holy Freda choose for prayer,
> And heavenly worship this congenial spot."

The patron saint, Saint Freda, or Saint Bride, was an Irish lady of great piety, who came over to christianise the Welsh. Her name is more honoured in Wales than that of any other saint, there being thirteen churches dedicated to her within the Principality.

Above, where the river is glistening in the sunshine, is the famous Scethrog fishery, the best in the Usk.

> "Too fast for him the fleeting moments speed,
> Who in Usk doth angle through the summer's day."

How changed is the course of the river here! Leaping from the rocks and overhanging trees, which have long been companions on her course, the river wanders through the fertile plain, meandering gracefully hither and thither Now it sweeps under the border foot of Pencelly Castle, anon beneath the precipitous height of the hill on which we stand. The fresh meadows, bright even now with their emerald green carpet, touch the very water's edge, and there is not a tree or scarce a willow to shade the wandering maiden in her course.

> "But thou art still the same in stream and pool,
> Still ever varying, ever beautiful,
> Now bright in sunshine, and now lost in shade,
> Now hurrying onwards like some startled maid
> Scared from her summer bower, again a deep
> Still mirror, placid as that maiden's sleep."

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There is a curious stone just below, near the fifth mile on the mail road, commemorating the death of the son of the Roman General Victorinus, and a little stream runs hard by in a dingle called Cwm-y-gelanedd, or the dell of slaughter.

It is impossible to notice all objects of interest. Maenest and Fynnon Iltyd are on the bank on our right hand. Below is Llanhamlach Church, and across the valley that of Llanfrynach, and the camps of Caerau and Tregare. The Mehascin brook, fresh and cool from that silent glen, Cwmorgwm, flowed by these Roman camps of times gone by, and supplied their baths with the purest of water. It is characteristic of this brook and of the adjacent mountain stream, the Cynrig, and of all the streams flowing from the Beacon range into the Usk, that they retain a certain size even in the driest summer weather. I have repeatedly noticed that in extremely dry summer weather the Wye is far lower in comparison than the Usk, if you make due allowance for the water abstracted for the canal. You see small streams dried up in summer near the head of the Wye; you rarely, if ever, see such an occurrence in the Usk Valley. The springs of the old red sandstone formation are stronger and more enduring than those of the Silurian rocks.

Whether we run our eye up the Cynrig Valley to where it rises at the foot of the Beacons, or along that grand range of mountains above Pencelly, embracing the Cwmbanw heights, or the Bryn, Brynteg, Bwlch-ar-fan, and that magnificent offshoot of the range, Cefncyff, our gaze will rest with wonder on the twin peaks of the Brecon Vans. There is little difference in the height of the two points, but the eastern one is the higher, and measures 2,910 feet above sea level. It has long been called "Cader Arthur," or Arthur's Chair, "famed Arthur's Beacon Chair," and that mythological giant—not the good King of the Round-table—is said to have made it his seat, the crescent of the mountain behind forming the back of the chair. Where he put his legs history sayeth not.

These Beacons have a fine outline, they are lofty, but yet clothed with verdure to their summit, and always seem approachable and companionable. The view from the summit is fine, and on an exceedingly clear day you may see thirteen or fourteen counties, and the Bristol Channel from Swansea nearly to Chepstow.

The prettiest ascent is up the Cynrig Valley and the Crofte Glen. Then by degrees the beauties of the mountains break upon you, and in the valley you notice the ever-varying play of light and shadow:—

> "Not without frequent pause, as ever new
> Some glorious prospect opens to the view
> Of Nature's citadels, as one by one
> The towers stand forth illumined by the sun."

And who does not retain even more pleasant recollection of that spot on the top, between the lofty peaks, where there is a small spring of water:—

> "Safe on the summit, near that famous well,
> Our bottles cooled within its rushy cell,
> The social meal is shared, the wine is quaffed,
> The speeches spoken, and the laughter laughed."

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Giraldus Cambrensis and Leland both describe the Beacons, and notice their height, King Arthur's chair, the spring at the top, and the great extent of prospect afforded from the summit.

We must travel quickly now, and have scarce time to notice the Slwch and Crûg hills, with their plainly-marked British camps, the wooded brow of Dinas, and Brecon itself, the pretty little county town, nestling in the valley beneath. That town, which Churchyard describes :—

" —— built as in a pit it were,
By water side, all lapt about with hill,
You may behold a ruinous castle there,
Somewhat defaced—the walls yet standeth still.
The river Usk and Honddu runs thereby."

Looking westward, the summit of the Cantref Bychan, or Carmarthenshire Beacon is seen. Here the Usk rises, and close to its source and beneath a precipice of magnificent Old Red Sandstone rock is embosomed the prettiest of lakes. Gentlemen of the Woolhope Club, I must call your attention to this interesting spot, and trust that the day may not be far distant when we may wander thither together.

To the north are the Epynt range of mountains, and in the distance that of Drygarn and the Ellenith mountains, extending to Plinlimmon. A little to the right, and looking across the fertile vale of Talgarth, the wooded slopes of Pontywal and Trephilip, and over the gorge of the Wye at Llangoed we see the Begwms of Radnorshire, and in the far distance Radnor Forest.

It remains now for me to ask you to contract your gaze, and look down on the lake beneath, and its immediately adjacent district.

The lake before us bears the various names of Breceinanmere, Llyn-Safaddan, Llangorse Lake, and Talyllyn pool, the two latter of which are derived from the parishes on its banks. The lake is the largest in South Wales, being five to six miles in circumference, 2½ miles long, and three-quarters of a mile wide. Though a beautiful and extensive piece of water, its beauty is somewhat marred by low and flat banks, and the fringe of rushes and tall sedges which extend to a considerable distance from the shore. It is fed by the Llyfni brook, which enters it at the eastern end, and by a brook of equal size, that flows through the village of Llangorse. The outlet is at the northern corner, and not far from the small island on the northern shore. The height of the lake has been much reduced by the straightening of the outlet within the last few years, and judging from marks on the meadows near the church at Talyllyn and Tymawr, I believe the height of the water, and therefore the size of the lake, to have been once greater than the present or past generation remember. The gorge of the Llyfni, near Trewalter, and Llandevail'g-Tregraig, was doubtless deepened by the natural action of water, but the straight cut from the lake to Llyfni bridge, recently cleaned out by the order of the Commissioners of Sewers, was evidently artificially formed. That cut, by whom and when made in the first instance I have not yet been able to ascertain, materially improved the outfall of the lake, and lessened its normal height.

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The eastern end of the lake is throughout deep, the opposite end from the island westward shallow. The contour of the surrounding country reveals this, even if the fact had not been ascertained. Pike, perch, roach, and eels are the common fish of this water. I have never heard of tench or trout being caught there. The pike are numerous, and have been taken over 30lbs. The perch run to the weight of 2lb. and even 3lbs., and are "most pleasant to taste." The perch is in my opinion the best of all fresh water fish, saving the Salmonidæ. The eels are very numerous, and grow to a large size; they are of two kinds, the flat nosed and the sharp nosed. Every autumn, on the first rise of water, if the wind blows down the lake from the south-east, large numbers of eels make their exit from the lake at night, and if not intercepted by the eel nets and traps on the Llyfni, find their way to the Wye, and thence to the sea. Their annual migration is coincident with, and as regular as, the fall of the leaf. The remarks of Leland as to the fish inhabiting this lake are given subsequently. Giraldus has the following:—"The famous lake of Brecheinioc supplies the county with pike, perch, excellent trout, tench, and eels."

In the olden time the privilege of fishing in this lake was esteemed of great value. By various charters grants of fishing were made to the monks of the Priory of Brecknock, and of Llanthoni, which latter place is not very far distant across the Black mountains. One of the successors of Bernard Newmarch gave to the monks of Brecknock:—"The land of St. Paulinus upon the Mere (now called Llangorse Lake), with the liberty of fishing three days in the week, and every day during the terms of Lent and Advent."

The present owners of the Priory and Abbey estates are still legally possessed of these rights. There are also other rights of fishery in the lake—altogether seven—and within the last twenty years certain fishermen living near Cathedine regularly netted the water. The form of net used was a seine, having a large purse in the centre. This they "pitched" here and there, and when pulling in the two ends of the net together on board the boat, drove the fish back into the purse. No one for the last ten years has made a practice of netting the lake, and the distinctive rights of fishery, formerly strictly observed, are no longer maintained. The only modes of fishing now in vogue are those by angling, and with trimmers, and the public enjoy the privilege of fishing the lake, when and where they like, without asking the leave of any of the representatives of the former owners. The pike are now very numerous, and the perch and roach still more so.

Water fowl of various kinds abound, chiefly the moorhen, baldcoot, grebe, and wild duck. There are also about a dozen swans on the lake, which Mr. Raikes has brought there. Plovers, herons, and sea gulls are constantly to be seen, and, not the least remarkable, large flocks of starlings, which roost throughout the autumn and winter months in the tall sedges. Every winter brings many other kinds of water fowl from the sea to the lake, and not unfrequently some that are very rare.

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There are several well-known legends about Llangorse Lake. One relating to its origin is preserved among the Harleian MSS., and is to be found in Jones' History :—

"A young man of small property pays his addresses to the lady of Llynsafeddan. She rejects him on account of his poverty, upon which he robs and murders a carrier; and, after displaying his ill-gotten wealth, he again offers himself to her. Being interrogated how he acquired it, he confessed to her, under an injunction of secrecy. She still refuses him, until he repairs to the grave of the deceased and appeases his ghost. This he readily undertakes, but on approaching it a hollow voice is heard exclaiming, 'Is there no vengeance for innocent blood?' Another answers, 'Not until the ninth generation.' Satisfied to find the evil day so long protracted, the lady marries him, and their issue multiply so fast that they live to see the ninth generation. But the judgment does not immediately follow, whereupon they prepare a great feast, and in the midst of their jollity and triumph a mighty earthquake swallows up the whole family, and their houses and lands are covered by the lake."

Others, again, who

"Their guide tradition make,"

believe that the Roman town of Loventium lies buried in the lake. The river Llyfni, or Lleveny, is supposed to bear some resemblance to Loventium, in sound at least, and the existence of a road in the neighbourhood called Heol Llovent is some argument in favour of the site of the missing Roman station being in this neighbourhood.

It occurs to me here to suggest a derivation of the name Llyfni: Llyn-wy, or the stream of the lake. "A circumstance concerning this lake, that happened a short time before our days, must not be passed over in silence," says Giraldus :—

"In the reign of King Henry the First, Gruffydd, son of Rhys ap Theodor, held under the King one comot, the fourth part of the Cantref of Caoc in the Cantref Mawr, which, in title and dignity, was esteemed by the Welsh equal to the southern part of Wales, called Deheubacth. When Gruffydd, on his return from the King's court, passed near this lake, which at that cold season of the year was covered with water fowl of various sorts, being accompanied by Milo, Earl of Hereford and Lord of Brecheinioc, and Payn Fitz John, the Lord of Ewyas, who were at that time secretaries, and being counsellors to the King, Earl Milo, wishing to draw from Gruffydd some discourse concerning his innate nobility, rather jocularly than seriously thus addressed him: 'It is an ancient saying in Wales, that if the natural Prince of the country, coming to this lake, shall order the birds to sing, they immediately obey him.' To which Gruffydd, richer in mind than in gold (for though his inheritance was diminished, his ambition and dignity still remained), answered, 'Do you, therefore, who now hold the dominion of this land first give the command.' But he and Payn having in vain commanded, and Gruffydd, perceiving that it was necessary for him to do so, dismounted from his horse and falling on his knees to the east, as if he had been about to engage in battle, prostrate on the ground, with his eyes

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and hands uplifted to Heaven, poured forth devout prayers to the Lord.' At length, rising up, and signing his face and forehead with the sign of the cross, he thus clearly spake:—"Almighty God and Jesus Christ, who knowest all things, declare here this day Thy power. If Thou hast caused me to descend lineally from the natural Princes of Wales, I command these birds, in Thy name, to declare it." And immediately the birds, beating the water with their wings, began to cry aloud, and proclaim him. The spectators were astonished and confounded, and Earl Milo, hastily returning with Payn Fitz John to court, related this singular occurrence to the King, who is said to have replied, "By the death of Christ," an oath he was accustomed to use, "it is not a matter of so much wonder; for, although by our great authority we commit acts of violence and wrong against these people, they are shown to be the rightful inheritors of the land."

"The lake also is, according to the testimony of the inhabitants, endued with miraculous power. It came to pass before that great war, in which all this province was destroyed by the sons of Jestin, that the large lake, and the river Leveni, which flows from it into the Wye opposite Glasbury, were tinged with a deep green colour. The old people were consulted, and answered that a short time before the great desolation caused by Howel, son of Meredyth, the water had been colored in a similar manner. In those days the lake sometimes assumed a greenish hue, and in our days it has appeared to be tinged with red, not universally, but as if blood flowed partially through certain veins and small channels. Moreover the lake is sometimes seen by the inhabitants covered and adorned with buildings, pastures, gardens, and orchards. In the winter, when it is frozen over, and the water is converted into a sheet of ice, it emits an horrible sound resembling the moans of many animals collected together; but this perhaps may be occasioned by the sudden bursting of the shell, and the gradual ebullition of the air through imperceptible channels."

The monk of Chester has collected and compressed these tales of wonder into the following lines:—

Ad Brecknock est vivarium,
Satis abundans piscium,
Sæpe coloris varii
Comma gerens pomarii
Structuras ædificii
Sæpe videbis inibi.
Sub lacu cum sit gelidus,
Mirus auditur sonitus.
Si terræ princeps venerit,
Aves cantare jusserit,
Statim depromunt modulos,
Nil concinunt ad cæteros.

Leland, speaking of this lake, saith—"Llin Sevathan is a iiii myles by south south est from Brecknock. It is in breadth a mile, and a ii mile of length, and wheras it is deepest xiii fathom. On the one side wel nere the ripe is a kinde of weedes that goith along the Llin, wherein the spaune hath sucur, and also the great fische. At great winds the water doth surge there marvellously. Llevenny cometh through this lake, no great river, and

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after great raine is parfightly seen of redde color in the middest of the lake. After that it is frozen, and with thaw it beginneth to breke, it makith such a noise, that a man would think it thunder. It bereth, as the principal fisch, a great number of bremes, and they appeare in May in mightie soulles, so that sumtimes they breake large netes; and ors frayed appereth (not in the brimme of the water) that yere againe. It bereth good pikes also, and perches in great number. Troutes also, and chevyns (or chub) by the coming in of Llaveny. Menne fish then uniligneis and they be very narrow. The hedde of the lake, where Lleveny river cometh in, is at Llanvihengle Kythedine. The ende is at Llanvihengle Talyllyn."

The noise made by the ice during the thaw, and even during a frost, is very loud. That, and the partial discoloration of the water of the lake at particular times, are of course, due to natural and well-known causes. I have myself frequently noticed, when the brook flowing from Llangorse village is flooded, a streak of red, extending from the point at which it enters, to the outlet of the lake.

The three parishes that lie close to the lake are Llanvihangel Talyllyn, the church sacred to the Archangel Michael, at the head of the lake; of Llangasty Tal-y-llyn, the church of St. Gastayn, at the head of the lake; and of Llangorse, or Llan-yn-y-gorse, the church in the fen or marsh.

In Llanvihangel parish, near the lake, there is the appearance of an old road or causeway leading to it from the village, as there is likewise from Llangorse on the North, and Llangasty Tal-y-llyn on the South. In Llangasty there are two mansions, formerly of celebrity, Tallyn house, and Trebinshwn. The first was the residence of the lord of the manor, and Jones doubted once whether the house was more than three centuries old. He was, however, induced, by seeing the arms of painted glass, taken out of a window in the house by the late Mr. Davies, of Courtygollen, to believe that the remains of a fabric of a much earlier date may be found there, though the house had at different times undergone such alterations as to have no resemblance whatever to the ancient manorial mansion. The late Mr. Crespigny intended to have rebuilt it upon a grand and extensive plan, but after some progress in the work it was stopped. Mr. Crespigny, through heavy losses, was soon obliged to sell the property, and it passed into the hands of the Holford family. Jones thinks that the painted glass was brought to the house from Blaenllyfni castle. Above the house, by the side of the parish road, is a mound, which has evidently been artificially raised; it is probably a tumulus or burying place.

Llangorse is called Mara in Pope Nicholas's taxation. In a grant of certain lands the tenements are described as being "at the town of the meer or lake of Breconium, situate on the side between the land of the lord of the manor and the lands of Roger the fisherman on one side, and on the other side next to the road or highway leading to Breconium."

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It is impossible to quit this our stand point without making one closing remark on the scenery around. "Industry, which magic-like can smooth the mountains rugged brow, and call forth landscapes from the dreary waste," has been exercised here. Look at those waving fields of corn stretching far up the mountain side, displacing the gorse and the heather. All those ploughed fields are being prepared for a crop of turnips. In Breconshire at least agriculture has made great strides, and we witness a scene to-day very different from that which the old historian saw (applause).

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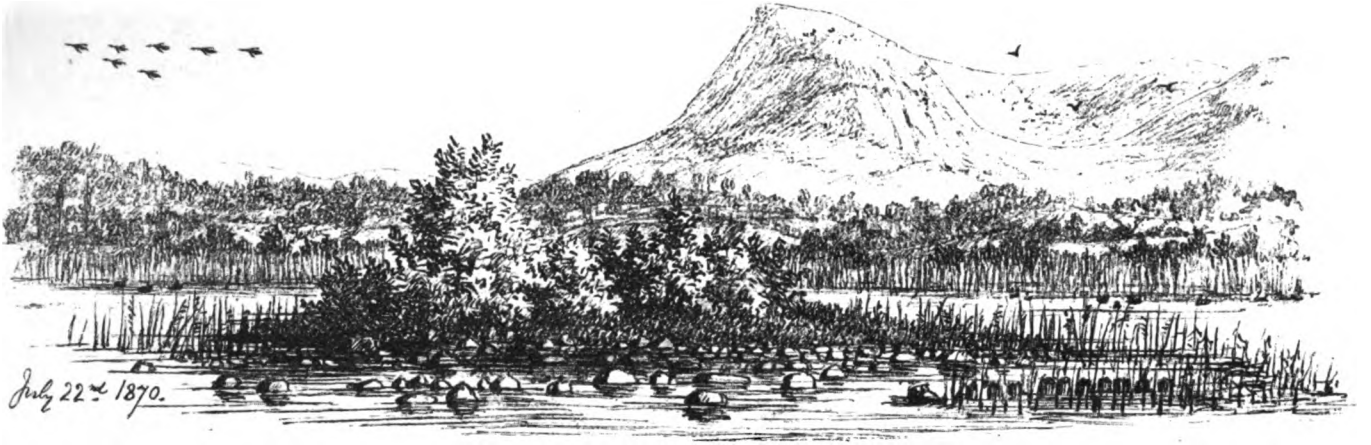
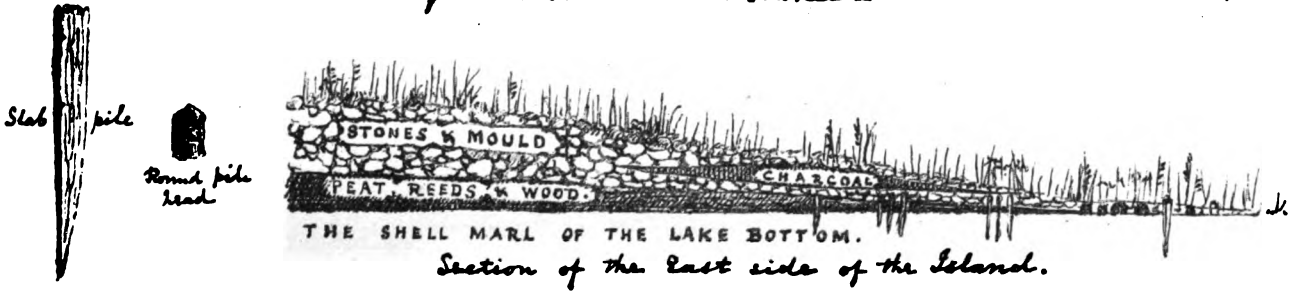


Ynys Burle, the Island as seen from Llangorse Lake
with Mynydd Troed in the distance.



Section of the East side of the Island.

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ON THE ISLAND IN LLANGORSE LAKE AND ITS PROBABLE ARTIFICIAL ORIGIN.

BY HENRY DUMBLETON, ESQ.

Part of the object of this day's meeting being to examine the island upon the Lake of Llangorse, the writer has been requested to give a short account of whatever points of interest, bearing upon its artificial origin and use for human habitation, have presented themselves in the course of some researches carried on by himself and his brother.

It may be almost superfluous to mention before this audience that, within the last 20 years, many remains of habitations raised upon piles, as well as upon artificial islands, have been found in several of the lakes of Switzerland and Italy. In England and Wales, so far as the writer is aware, no such remains have been hitherto found, but in Ireland there are many such artificial islands, bearing in construction and arrangement a striking similarity to the one under discussion. They are there termed "Crannoges," or "Stockaded islands."

Very general interest was awakened by these discoveries, since which persevering researches have disclosed a great variety of articles found among the remains. There are not only weapons of war and the chase, but also domestic utensils, portions of clothing, fruits and grain, throwing much light upon the habits of these lake dwellers, and at the same time affording evidence of great antiquity.

A few remarks upon the apparent change of level of the lake of Llangorse will not be out of place. The area has certainly at one time been far more extensive than at present, as evident by adjacent flat meadows and raised beaches. It has certainly also at one time been very much less than at present, judging from the remains of trees now under water, on the eastern side and elsewhere. Indeed it is highly probable that it may have undergone many changes of level. It is easily conceivable that these may have occurred from an unusual rainfall, causing more accumulation of land and debris than could be carried off by the little stream Llynvi. When such a bank became raised, the waters of the lake being pent up, would at length gain sufficient pressure to force their way through, very possibly also deepening their former channel and thus lowering the surface considerably below what it had been originally. These causes operating alternately would thus produce the evidences of many varying levels at successive periods. The old native name of the lake is Llyn Savathan, which, the writer is informed, means "the Lake of the Sunken Land." This may be with reference to some one of the above mentioned changes of level, or to the tradition that the

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waters of the lake at one time suddenly rose, and overwhelmed the human habitations. Whether, however, the lake rose, or the land sank, the tradition does not state; nevertheless, there is, to the present day, a strong belief in the locality that the tradition is not without foundation. On this some remarks will hereafter be offered.

It appears strange that the structure of this island should not have attracted any attention until within the last two or three years. Yet it seems obviously most remarkable that it should present a rising surface of various sized angular stones, some weighing over a hundredweight, within 90 yards of a flat alluvial shore, where not a stone is to be found. This circumstance at all events fixed the attention of the writer, and on examination it was evident the stones were not *in situ*, but had been conveyed there by artificial means. The summer of 1868 being remarkably dry, and the water of the lake very low, led to the discovery by the writer of the piles by which the island is partly surrounded, as it were by a stockade. A few of these were first observed close beneath the surface of the water, and a few inches only above the bed of the lake. One having been at once laboriously extracted, gave satisfactory proof of the interesting nature of the discovery. There is no clue to what may have been the original height of these piles out of ground, the tops of the whole of them having been worn by the action of the water to a pointed form. Upwards of sixty of them have been counted. They are all of cleft oak from 3ft. to 6ft. 6in. long, 10 to 16in. broad, and averaging 1¼in. in thickness, pointed at the lower end apparently by a metal tool. In all cases they have been driven into the marl to within a few inches of the length stated.

The accompanying plan shows the disposition of these piles around the island. Several were disclosed to view on moving the stones at the water's edge, and even within the present limits of the island, where it is quite probable there may be many others. These appeared to have formed an inner stockade, as if the limits of the island had been subsequently enlarged by the addition of the outer one, and materials deposited within. The plan will also sufficiently explain the form of the island. It will be observed that these flat piles do not extend all round the island, but only as far as it would be chiefly affected by the prevailing winds, which, at times cause a considerable sea upon the lake. Very many loose stones are lying in the water at a distance of a few yards around the island; these may have been intentionally deposited there, to break the force of the waves, or they may have become accidentally displaced from the upper surface of the island. The remains of several round piles, or rather mere poles, mostly of soft wood and driven but a short distance into the bottom are found outside the island, some also at the margin and within it. No regular arrangement of these can now be traced, but many have altogether decayed. Supposing that these may have been piles, on which dwellings were erected, the superincumbent weight would have been sufficient to steady them in the water, notwithstanding their having comparatively but a small hold in

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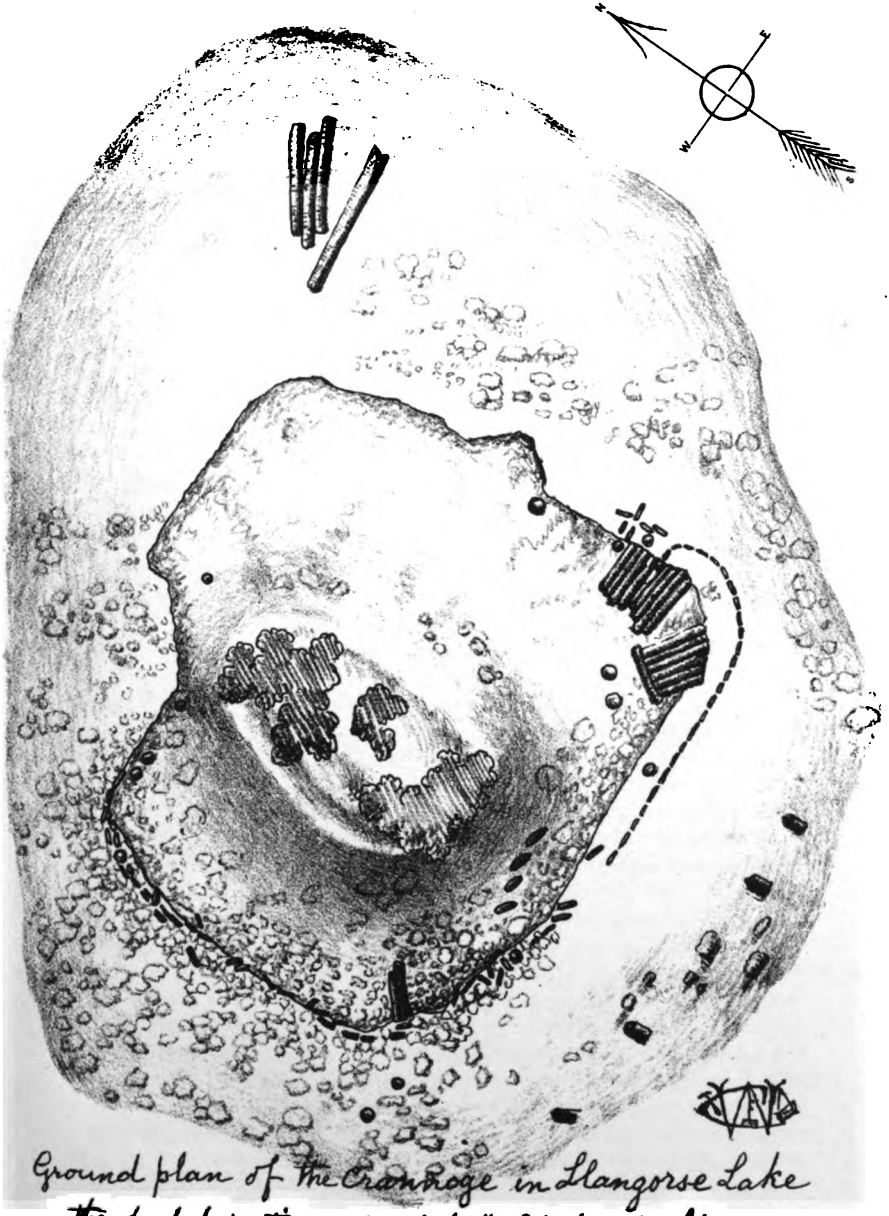

Ground plan of the Crannoge in Llangorse Lake
the shaded portion extends to the 2 feet water line.

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the bottom. They would also, of course, have been bonded together. On the other hand, it must be conceded that these piles may be of a much more recent date, and used for the purpose of fastening boats or nets.

It is important to note the state of preservation in which the flat oak piles were found. Four or five of them in all, were extracted. They were all of heart of oak, cleft from large trees, of course with a view to durability. The adherent marl being washed away, the wood appeared perfectly fresh and sound, but on cutting into it, the wood for nearly half an inch in depth, was found to be quite soft, and of no strength whatever; deeper in, however, it retained all, or nearly all, its original strength and character. After being out of water and exposed to air for some days, it turned quite black, and the exterior soft portion cracking transversely, it assumed exactly the appearance of a piece of charcoal timber. The specimen shown is a good illustration of the general condition of these piles. Those which are found within the island and occasionally exposed to air, are not nearly so well preserved.

In order to examine the structure of the island, it was necessary to sink several holes. The principal of these was at the centre or highest point, about 4½ft. above the then level of the water. For nearly three feet from the surface were large loose stones and earth, then a layer of tolerably compact peat, lying upon the remains of reed and small wood which had apparently been bound together like faggots. Below these was stiff marl. These proportions were reduced on approaching near the present water edge, but the whole island was thickly covered with stones, except at the North-east angle, where a deep deposit of vegetable mould, with only an occasional stone was found. The lower portion of this mould contained a great deal of charcoal, and below that again the peat and reeds. In this portion of the island bones were found very plentifully, and at all depths above the peat. Some of those that were lowest down were apparently the freshest looking. In the adjacent shallow water were also great numbers of bones and teeth, and some bits of charcoal. Many of the larger bones were split and cracked, as if for the purpose of extracting marrow or brains.

Some of these bones were sent last summer by the writer to Professor Rolleston, of Oxford, who wrote that "the chief points of interest respecting them were, first, the presence of two varieties of horse—one small, such as a Welsh pony is, and the other large (as I am informed large horses appear to have existed as well as mere galloways in the very earliest human periods in this country); and secondly, the smallness of the then ordinarily eaten mammals, *sus*, *bos*, *ovis*. The horse was eaten formerly, especially by the Pagans, and it may have been eaten by the inhabitants of your Crannoge, but there is no evidence from splitting or burning that they did so. I have not found any deer, dog, fox, wolf, marten, or other mammalian bones than those I mention, viz.: horse, pig, sheep, cow, nor any bird, nor other bones of any kind amongst those you have sent me."

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Some other bones, found subsequently, were exhibited, and a paper was read on the subject by the writer's brother, at the meeting of the British Association at Exeter, last autumn. The bones were examined by Mr. Boyd Dawkins, who recognised among them those of the red deer, wild boar, and *bos longifrons*, and stated that the group altogether, from the greater proportion of wild than domestic animals, indicated a remote period of deposition.

The only implements that were found were two bone awls, lying very near to a large piece of leather, about two feet below the surface, the edges of which had been perforated, and the remains of a leather thong or lacing were still in the perforations. Three or four bits of pottery were also found, an oval stone which bore marks of grinding, and a piece of bronze, apparently a portion of some small hollow utensil: whether coeval or not with the other relics it is impossible to say, but, judging from the concentric lines in the hollow part and the general character of the metal, if not altogether modern, it is probably of Roman origin.

At the south-eastern extremity of the island are two square platforms of round stems of soft wood, the use of which is obscure. They may have formed the floor of a small dwelling, or, their surface being inclined to the water, they may have served for hauling up boats.

The channel between the island and mainland being very narrow, it naturally occurred whether there might not have been a permanent passage or gangway to connect the two. After considerable search, however, only four logs of wood were found which could at all corroborate this idea. Three of these were of soft wood, and one of oak, with a notch cut across the top. These were found in about two feet of water, and ten yards from the north-east angle.

From the above evidence there can be no reasonable doubt of the island having been constructed and used as a human habitation, but at what period there are no data derivable from the discoveries as yet made or from any local history.

Giraldus Cambrensis, who wrote his Itinerary in 1187, makes special mention of the Lake of Brecheinoc, as it was then called, the quantity and kinds of fish in it, the wild fowl there, the water becoming occasionally tinged with red, or, as in the present day, with green. "Moreover," he says, "it is sometimes seen by the inhabitants covered and adorned with buildings, pastures, gardens, and orchards." It is well known that this tradition still lingers.

If this island had been inhabited in his day, so accurate an observer would hardly have omitted to record it; yet he makes no mention whatever of the island. Had it been formed or inhabited since, it would surely have been commemorated in local tradition as a specially worthy subject, for it must be borne in mind that these Lake dwellings could never, in any country, have been resorted to where a choice of locality was open, but, doubtless, with a view to security alone. The inhabitants were either compelled to resort thither

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from fear of their neighbours on the mainland, or they were, themselves, the men of violence who lived partly by plunder, which they conveyed to their refuge in the lake, whence they might, generally with advantage, defy pursuit.

The latter was probably the character of the dwellers upon this island, otherwise how account for the great variety of bones, not only of wild animals —which formerly abounded here—but pigs, cattle, horses, and sheep. If they were peaceable men, they must have had more contrivance in economising space in their farm-yards than prevails in the present day.

But to refer again to the old tradition of the submerged city, and the name of the water—"Lake of the Sunken Land," it is very possible there may have been other similar dwelling-places, which, by some catastrophe, may have been engulphed. One other such island, of much smaller dimensions, is known to the writer, though without protection by piles.

What was before said regarding the undoubted change of the level of the lake, will here be suggestive of an explanation of the old tradition. The raised beach in the meadow below Talyllyn Parsonage shows how completely this island, if it then existed, must have been submerged; and it may have been at this period that Giraldus visited the lake. The results of tolerably careful dredging and sounding in the narrow southern extremity of the lake—600 or 700 yards in length —show that the bottom is very level, the depth of water increasing from about 12ft. to 15ft., where it may be said to join the larger portion of the lake.

On examination of the nearly level meadows about Mr. Raikes' boat-house, the upper soil beneath the turf is found to be a kind of peat, from one to two feet in thickness, composed of the remains of reeds and other aquatic plants. Below this is the shell marl. Along this shore the water deepens, rather abruptly, to the depth above-mentioned, and on examination of the bottom, by dredging, the same formation is found as upon the adjacent meadows. There is, first, the layer of peat materials, but of course, being under water, not compacted, and below is the shell marl. Particular attention is desired to the fact of the bottom here being level, or as nearly so as the meadows above. This was, doubtless, at one time comparatively shallow water, or the materials for the surface layer of peat could not have grown there. There may have been many pile dwellings here, or along its banks. Then, to all appearance, a sudden rise of the water took place, perhaps to the height of 20ft., or nearly level with the spot upon which Talyllyn Church is built. A fresh deposit of shell marl then commenced, and, in due time, the peat formation was deposited.

The term "sunken land" may thus refer either to the portion thus deeply submerged, or to the shallow shores about Talyllyn Church, where it is extremely probable there may have been dwellings on dry land. A subsidence to the extent of a few feet afterwards took place through natural causes, reducing the level to what it is at present, or within about 18in. of it, by which amount it was reduced, by artificial drainage, a few years back.

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One other circumstance, which may be connected with the two periods mentioned, must not here be omitted. The meadow adjacent to the island is alluvial, but at the level of the water, and for some depth below, are the remains of a quantity of timber, apparently *in situ*. One upright stem, with roots, was found under water, between the island and the shore, a short distance from the latter. This, in the writer's view, must have grown here prior to the overflow of the water which submerged the meadows about Talyllyn church. When this took place the trees died, decayed, and fell where they now are, and were gradually covered up by earthy materials brought down into the lake during the winter floods. It is remarkable that the shell marl was not found at this spot, though it again reappears at a short distance. It is not unlikely that the outflow of the Llynvi brook may formerly have been at this spot.

In conclusion, the writer ventures to hope that this recital of his experience and ideas in regard to this mysterious island has not been without interest, and should it occur to any that farther investigation might produce better results, he begs to assure them that he considers his own researches anything but exhaustive, and that very much of both geological and historical interest still remains to be discovered and explained (applause).

The Rev. C. J. ROBINSON asked why, considering the shallowness of the narrow strip of water which separated the island from the mainland, it may not at one time have been joined to the land, and perhaps separated from it artificially as a means of defence.

Dr. M'CULLOUGH, in reply to this, said that not only was the island surrounded by a deep deposit of shell marl, but so far as had been examined the shell marl extended beneath the island itself and formed its base. Now this shell marl is a recent deposit formed of the shells of fresh water molluscs, and it is needless to say that since its deposition no geological disturbance can have occurred sufficient to place the stones which they saw around them on the top of this, geologically speaking, very recent deposit. Doubtless, therefore, these stones were brought there by human agency.

Mr. LEE asked permission to say a few words on the paper which had been read. His first remark was that members were exceedingly obliged to Mr. Dumbleton for the clear and straightforward statement of facts which they had just heard: the paper evidently contained all the information which was yet known as to the place. But he wished, secondly, to caution the members as to considering a Crannoge like this to be at all of the remote or unknown age which was claimed for the Lake dwellings of Switzerland; and he brought forward this caution more especially, as some antiquaries of note were disposed to doubt the very existence of a Crannoge in this place; but he must add that

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those who thus doubted had never set foot on the island, and had merely contented themselves with a view of it from the mainland. Mr. Lee said that he considered this island to be similar to the Crannoges, or fortified islands, found in Scotland and Ireland, which, while they date doubtless from a considerable antiquity, yet evidently were used and inhabited till about two centuries ago, and this can be proved historically. These Crannoges agreed in almost every respect with the peculiarities of this Llangorse island—the flat slab piles of oak, the interlaced fascine work within them, the large quantity of bones and charcoal found both within and without the piles, all pointed to the same mode of living, and to the same grade of society; and as the remains of bones had been examined by competent authority and had been shown to be of great antiquity, Mr. Lee said he could not see what room there was to doubt the fact of this having been a Crannoge almost precisely similar to those of Ireland and Scotland. The only thing which he must own he doubted was as to the round piles having actually supported wooden buildings on platforms over the water—like those of the Swiss dwellings. This he could not see sufficient evidence to believe; and in conclusion he strongly urged on the members that the place had yet to be thoroughly examined. The only safe data to go upon in judging of the antiquity were the implements found in it; and, so far, very few had been discovered. The piece of bronze now exhibited, though probably very old, yet showed that it had been cast in a kind of mould turned by the lathe, thus disposing of any very high antiquity. When implements are found jointly with the remains of animals which lived in olden times, then, and not till then, could we come to a perfectly definite conclusion as to its antiquity (applause).

J. E. THOMAS, Esq., F.G.S., of Hay, then introduced a discussion with reference to the original name of the lake. He thought it could not bear the interpretation put upon it in the excellent paper they had just heard read as the Lake "of the Sunken Land." Jones, in his History of Monmouthshire, translated it the Lake "of the Standing Water;" and the compiler of the Ordnance Map, in whose profound knowledge of Gaelic he had great faith, called it "Llyn Safaddu," and not Safaddon or Safathon, which seemed to point to a different meaning altogether—"Safu," a primitive word meaning a mouth, and it might thus be the Lake "of the black gorge or chasm." Then again the island itself is called on the Ordnance Map "Ynys Bwlc," which might be derived from "Buwch," or in its ancient form "Buch," a cow—the Cow's Island, or "Bwch," a he-goat—the Goat's Island. It may also be from "Bwlch," a gap or pass, or if considered an adjective, when it means broken, cut, jagged, it would be "the notched or jagged island"—a name appropriate enough to its stockade origin.

Mr. Thomas has since obtained the opinion of one of the first Welsh scholars, Gweirydd ap Rhys, on the subject. We have the pleasure of giving

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it in full, though it seems almost to prove that the name is a hopeless corruption :—

Bangor, 26th May, 1870.

Dear Sir,—The only information that I can give you is the following:—

1. Llyn Safaddan is called by "the Britains," says Camden, "Linsavathan and Linsavathen, that is, a lake of standing water. Giraldus termeth it Clamosum, that is, Clamorous, or Crying Land, because it maketh a strange noise, like thunder, as often as the yce thereon doth thaw."—*Britannia*, p. 628.

Lewis Glyn Cothi writes it "Savaddon":

"O don Llyn Savaddon vo
Ni thynwyd han aeth yno."—*Works*, p. 189.

I cannot reduce Safaddon into any probable roots. All know what is Saf—a stand; but what is addan? We have such word as *wlaeth*—a standing still; but how this lake may be standing still, when we know that the river Llyfnwy is issuing from it, and especially if it is Clamosum, as Giraldus says?

I can reduce Savaddon of L. G. Cothi into Saf—a stand; and addon—fruit; offspring. Then, it would be a lake of standing fruit, or of standing offspring! Offspring, indeed, perhaps, might mean the fish which it may be producing. However, I am afraid that old Lewis made it Savaddon in order to have it rhyme with don: "O don Llyn Savaddon vo."

My own opinion is (and let your friend take it for its worth), that "c" is left out of the name; and that the real name is, Llyn Safaddanc, *i.e.*, the lake of the standing Addanc.

Addanc, or afanc, is an imaginary animal, like the Hydra of the Greeks, and not a Welsh name for the beaver, as some late writers imagine. The old Welsh name of the beaver is "Llostlydan." The fabulous Triads say that one of "the primary great achievements of the isle of Britain," was, "the prominent oxen (ychain banawg) of Pan the Mighty drawing the addanc (afanc) of the lake to land; and the lake broke out no more."—*Myv. Arch.*, 2nd ed., p. 400, Tri. 97.

I really believe that the name Safaddan has something to do with the above fable of the Triads.*

2. Ynys Bwlc. This cannot be Ynys Bwch, as "l" is never silent in Welsh; but "c" was often written for "ch" in old MSS., and Englishmen write it frequently for the same letter. Moreover, "c" was used generally by old writers for "g" at the end of words: as Madawc, Caerawc, bolIawc, for Madog, Caerog, hollog. Then, bwlc may be either bwlch—a pass, a hollow; or bwlg—a buck, which your friend translated into a cow!

Yours faithfully,

GWERYDD AP RHYS.

* Llyn Safaddan is not very far from Tregaron, where Twm Sion Catti lived, the author of the Fabulous Triads.

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ON THE HABITS OF PLATYPUS CYLINDRUS—*Fabr.*

By T. ALGERNON CHAPMAN, Esq., M.D., Abergavenny.

This beetle has been well described by Ratzburg in his "Forst-insecten," and the larva is well described and figured by Perris, but neither give much detail as to its habits, and do not, indeed, appear to have met with it in sufficient abundance to make many observations with regard to them. I have thought, therefore, that the following account of it, founded on observations made two years ago, when I was studying the Xylophaga—some of them confirmed by further investigation—might be of sufficient interest to be worthy of being read to the Woolhope Club.

Platypus Cylindrus burrows into the solid wood, and, in consequence, is rather difficult to observe; the gnarled texture of a solid and by no means rotten oak stump being a most unpromising material to slice up in order to expose the burrows of the beetle, as desired. Its history, however, presents several points of much interest. The burrows, in which both perfect insects and larvæ are found, have always an extremity open on the side of the stump. They are of uniform diameter throughout, viz., that of the full-grown larvæ and perfect beetle, presenting no narrow burrows of young larvæ, as the observation of most of the other Xylophaga would have led us to expect. And the inhabitants are not confined each to its own branch of the burrow, but the larvæ, to the number of from sixty to a hundred, together with the perfect beetles, their parents, run actively backwards and forwards in the burrows, and from one branch to another, getting out of each others way, backing into a branch to let another larva pass, just as a train is shunted into a siding. The following observations leave untouched several points in the history of *Platypus* which I should have liked to have cleared up, for which my excuse must be the difficulty of tracing the proceedings of the insects in the centre of the solid masses of oak they inhabit.

The usual habitat of *Platypus Cylindrus* is in oak stumps, but I have met with it also in beech. After a tree has been cut down, although the stump may throw up no shoots, it yet maintains for a time a sort of life; portions of bark, for instance, even two or three years after, look much like that from a living tree. It is in such stumps that *Platypus* makes its burrows, and in those parts of them which, though to all appearances sound, have, one or more years after the fall of the tree, entered into the first stage of decay. What appears to be essential is the presence in the wood of a certain fungus which probably lives in the fermenting and decomposing sap. I shall recur to this fungus when mentioning my observations on the young larva of *Platypus Cylindrus*.

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After a brood, or rather colony, has been reared in one part of a stump, another part, which has mean time reached the proper condition, is often attacked the following year. So that it may happen that one part of a stump is quite rotten, whilst another is still tenanted by the beetle; but wherever there are larvæ still feeding, the wood continues apparently sound.

There is another point which seems important, that is, the position of the stump. I have rarely found them in stumps on level ground, but nearly always in those on a steep slope. This probably arises from the earth above yielding a supply of moisture to the latter, whilst there is sufficient drainage below to prevent their being waterlogged, and the wood is thus kept of a proper dampness. It must, moreover, arise to some extent from stumps on a slope presenting on the lower side an abundant surface, from which the beetles can make their attack; as they always bore inwards horizontally or slightly upwards, they thus command nearly the whole stump, whereas with a stump whose surface is level with the ground they can command very little of it.

During July and August *P. Cylindrus* emerges from the pupa state, the greater number during the last week in July, and at this period they commence their burrows; on July 15th I found such a burrow nearly three inches in depth. Occasionally an odd burrow is to be found, but usually the burrows are in colonies, and as many as fifty entrances may be found on the side of a stump, scattered over a surface twelve to fifteen inches wide and four or five high. The burrows are often begun on a smooth surface, but usually any little hollow or irregularity is taken advantage of in commencing the burrow. I have a fine specimen, in which a strip of bark had been removed from the side of a large root, and the margin was cicatrising; in the angle all round this surface the entrances of burrows were closely placed, only one or two others being present at other points. The burrow from its mouth on the surface of the stump is a perfectly clean-cut cylinder.

Each burrow is tenanted from its commencement by a pair of beetles. Both beetles and full-grown larvæ feed on the wood, and when they are doing so, they eject little rounded nodules of frass, which have obviously passed through their alimentary canals. In the case of *Hylesinus Fraxini*, and several other Xylophaga, I have satisfied myself that the parent beetles eat the removed material when they are forming their burrows of oviposition. With *P. Cylindrus*, however, this is not the case. In forming its burrows it does not eat the removed material, and instead of the end of the burrow being rounded, it is at this period flat, i.e., a plane at right angles to the axis of the burrow; and the ejected frass is not found in the little rounded pellets afterwards observed, nor in little lenticular bitten pieces, which appears the only other alternative, but in very fine splinters, most of them of a length equal to the diameter of the burrow. I may remark here that this burrow is always made across the fibres of the wood. The ejected frass, which forms a little heap outside the burrow, looks very different from that afterwards thrown out. Both sometimes accumulate to such an extent as to bury the mouth of the burrow,

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and if the frass should be matted together by being wetted, the burrow often extends through it to the surface, occasionally forming a tubular addition to the burrow of an inch or more in length; but this is a purely accidental occurrence.

I had the good fortune on one occasion to observe the process of separating this splintery variety of frass. I had so split a piece of wood as to expose a burrow within a few lines of its inner extremity. In this burrow was a beetle that could not, in these circumstances, completely hide itself. It continued, however, to work, and kept ejecting frass of this description. It moved very gently, as beetles do when moving their jaws, with the exception that every ten seconds it came out with a sudden jerk for a distance equal to one-third its own length, so one could not help concluding that something it was pulling at had suddenly given way. I think that I am justified in inferring from this that these little splinters are bitten through at one or both ends, and then laid hold of and separated by a pull ending in the sudden jerk resulting from the bit of wood becoming loose.

I may mention that, when perfect, *P. Cylindrus* has very long slender tarsi, and that it is a matter of notoriety among collectors that it is usually met with having these broken. This is almost invariably the case with those beetles that have formed a burrow; they often possess no tarsi whatever, except about half of the basal joints. It occurred to me that this sudden jerk sufficiently explained this want of tarsi. Such a beetle when extracted from his burrow is utterly helpless, yet in this state he manages to run backwards and forwards in his burrow with great facility, to live there in apparent health for many months, and as he never naturally leaves the burrow again, the loss must be of but little consequence. The newly-emerged beetles, that is, those possessing their long and delicate tarsi, do not seem comfortable on a smooth surface, but over a rough piece of bark they can run with great agility. I suspect, though on this point I have made no observations, that they find them very useful in sustaining the body in a proper position at right angles to the surface of the wood or bark in commencing their burrows. As to the mechanism of this jerk by which the splinters are separated, the anterior femora of *Platypus* (ὁ πλατυς ποὺς) are extremely broad, or rather deep, from which circumstance indeed the genus is named; and are not by any means narrowed in the other diameter to make amends, but are really extremely strong limbs; the anterior tibiæ are, externally, diagonally ridged, but in such a way that though the ridges are diagonal to the tibia, they are, when it is in its usual position, transverse to the burrow, and are sharpest forwards, so that they must give a very firm hold of the wall of the burrow when the beetle uses his strong femoral muscles to push himself backwards.

Although the jaws are, as usual, directed forwards, their sharp, cutting edges are quite in advance of the beetle, when the head is in its normal position, and are thus beautifully adapted for cutting the wood round the side of

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the burrow at its extremity, and, by a change in the position of the head, may serve to seize the fibre of wood to pull it off.

When the burrow is some six or seven inches in length, a rounded extremity is made to it, the female beetle having oviposited at its extremity, it is for the time abandoned, and the parent beetles commence the construction of a branch. Eggs are laid as early as the beginning of August, and as late as the end of October, and usually, I think, in recently constructed branches of the burrow. I have found single eggs, and groups of two or three, at various points in such a branch, but the proper place seems to be at the rounded extremity, as here I have found groups of nine, twelve, and even of twenty-three eggs. These are simply little masses or heaps of eggs lying loose close to the end of the burrow. In such burrows are also found the young larvæ; but before the larvæ are hatched there appears on the wall of the burrow a damp, greyish-white, felty-looking coating, sometimes narrowing the gallery to half its width, and it is the undisturbed appearance of this coating which leads me to believe that such a branch of the gallery is for a time abandoned by the parent beetles. I have found such a gallery in November unintruded upon, when other branches of the burrow contained half-grown larvæ; whether these kept out of it by their own instincts or were marshalled from it by their parents I cannot say. But of this there can be no doubt, during the autumn months several batches of eggs are successively laid in different branches of one system of burrows by the same parents, of which the first are often full-grown before the last are laid, and the burrows containing eggs and young larvæ are respected by all the other inhabitants of the burrow, notwithstanding the fact that the full-grown larvæ are very fond of this felty coating, which I have seen them scrape off the walls with their jaws with apparent gusto, and there is no physical impediment in their way.

The greyish felt lining of the burrows consists of a mass of tubes belonging to the fungus to whose existence I have already alluded. The tubes consist of a very thick wall filled with small rounded bodies (spores?) and similar structures may be found in the surrounding wood, which has a sweet heavy smell similar to that of freshly cut oak wood, but much more strong. The tubes that exist in the wood are no doubt properly to be regarded as mycelium; whether those in the burrows are so or an abnormal form of fructification I cannot say. I believe that this mycelium is not that of any of the larger funguses, but is probably that of some mould, or some species allied to the yeast plant.

The newly hatched larvæ are not the straight cylindrical creatures that the full-grown larvæ are, but are rather flattened and disc-shaped, the lateral region being largely developed, and each side carrying two rows of long stiff bristles, each bristle surmounting a lateral tubercle. As the larvæ consists of a head and twelve segments, each row consists of eleven bristle-bearing tubercles, the bristles of the anal segment being directed backwards. These bristles

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are probably of great assistance in locomotion. The young larvæ adhering to the damp felty wall of the burrow by its moisture, moves freely along it or round it by a wavelike motion, and feeds entirely on the fungus exudation until it has grown large enough to occupy the whole diameter of the burrow.

The full grown larva presents corneous points at the same situations as those occupied by the bristles of the young larva. With each change of skin they become shorter, till they are thus only represented in the last skin. I need not describe the full grown larva which has been figured by both Ratzeburg and Perris, and well described by the latter in the Annales des Sciences Nat. Series II., Tome 14, p. 89. The only exception I would make to Perris's description is that he describes it as rather thickened beyond the middle, and he so figures it. The larva is really quite cylindrical when at home in its burrows. Perris does not appear to have met with it plentifully, and to have made his descriptions from specimens removed from the burrows, without noting that soon after removal the larvæ became rather thicker beyond the middle segments, and instead of continuing straight became curved, and then much resemble the larvæ of the other Xylophaga. They are extremely muscular, and this change probably results from their contortions not being counteracted by their usual points of resistance, the walls of the galleries.

The larvæ must feed up very rapidly, as I find full-grown larvæ in the burrows when they can hardly have been made more than a few weeks. I have found no evidence of eggs being laid after the late autumn; and during the winter the burrows contain full-fed larvæ. The parent beetles also live in the burrows all winter. During the winter all the inhabitants are nearly dormant, but in autumn and spring much frass is ejected.

At first and before there are any larvæ in the burrow this is all of the splintery variety, but afterwards it is entirely the small pellets of digested wood, and consists almost entirely of the excreta of the larvæ. The young larvæ certainly live on the fungus exudation I have described until they grow large enough to fill the burrow. The large larvæ must still do a deal of eating, both from the amount of fat they store up and their muscularity. There is also much frass ejected, and these considerations lead me to believe that the full grown larvæ eat the wood, though I have no proof of it, and I know that they do eat the fungus.

I think it is also evident that the various branches of the burrow are increased in length and complexity after the splintering process is finished. In the spring, also, the pupal cavities have to be excavated, and this must certainly be done by the larvæ themselves, both because the parents are frequently dead at this period, and the amount of excavating during a brief period must be very great, more than the parent beetles could overtake. I believe that the parent beetles die usually in the following April or May, after the larvæ are full fed, but before the pupal cavities are commenced.

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The arrangement of the branches of the burrow is somewhat irregular, usually consisting of a few long straight galleries that are, roughly speaking, parallel to each other. Sometimes a branch leaves another near its extremity and returns nearly parallel to it, but they never anastomose. Sometimes they consist of short curved portions continuously dividing dichotomously, making, though not all in the same plane, a curiously regular pattern, something like a branch of mistletoe. The much smaller burrows of *Tomicus dryographus*, the only species we have in this country at all allied in habit to *Platypus*, divide trichotomously with much more regularity than those of *Platypus*.

The principal function of the parent beetle after oviposition appears to be the ejecting of frass from the open mouth of the gallery, which they alone appear to do. I have seen a small quantity brought every few minutes, at a season when the larvæ were busily feeding. It seems to be done by the male or female beetle indifferently.

I have strong reason to believe that either of these directs the movements of the larvæ in the burrows, not only from the burrows containing eggs and young larvæ being kept undisturbed, but also from larvæ falling out of burrows from which the parent beetle had been removed, a circumstance that does not otherwise occur.

The pupation cavities or burrows are excavated on either side, or I should rather say on the floor and roof of a straight branch of the burrow, tolerably close together, so that the two sides of a burrow often contain several dozen within a few inches. They are always at right angles to the gallery from which they start, and also parallel to the fibres of the wood, of the same width as the ordinary galleries, and just the length of one beetle. The larvæ, after excavating them, must come out and enter backwards, as the head of the pupa is towards the burrow, and the larvæ is unable to turn round in it. It is shut off from the gallery by a slender partition of frass, which looks as if it had got there by being pushed out of the way by passers by, and it is difficult to see how it could be placed there in any other way, though as it in reality completes the cocoon of the larva within it is hard to believe that its presence is thus as it were accidental.

I had usually found the pupation cavities placed vertically, *i.e.*, one set above the burrow, whose inhabitants must be head downwards, the other set below the burrow, whose inhabitants must have the head upwards, it occurred to me, in connection with certain theories as to the sexes of bees, to investigate whether the different position had any influence on the sex of their inhabitants, and I provided myself with a fine log occupied by *Platypus* for the purpose. I found, somewhat to my disappointment, all the pupation cavities horizontal, that being the direction of the fibres of the wood in the log. The beetles were, I need hardly say, placed indifferently as regards the sexes. I tried to investigate the matter in a suitable stump, but was not successful in finding many beetles ready to emerge; the few I found, however, did not favour any theory

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in the matter, but I was enabled to determine that the line of the fibres of the wood, and not the line of gravity, determined the direction of the pupation cavities. This must be of use in preventing the cavities from contiguous burrows from interfering with each other.

When the beetle emerges it soon leaves the burrow, and either forms a fresh burrow in the same stump, or takes wing to a fresh locality. Those I had in captivity appeared to prefer the sunshine for their flight. It is only by taking them before they have left the burrows in which they were reared that they are to be captured in perfect condition.

The beetles are able to make a very audible squeak by rubbing the abdomen rapidly against the elytra. When a log containing a number of burrows is shaken, the beetles burrowing within answer with quite a chorus of squeaking. In order to detect it the ear must be held close to the wood.

I have never met with *Colydium elongatum*, a very rare beetle, only found as a parasite of *Platypus*. The only parasite I have seen is a small white *Acarus;* the full-grown *Acarus*, until its legs are detected, extremely resembles in size, colour, and outline the egg of *Platypus*, and it lays its egg on that of the beetle, three or four sometimes adhering to the egg. I believe it extracts nutriment from the larvæ of the beetle, though without doing it much real injury (applause).

(This excellent paper was illustrated by the beetles themselves, the frass masses, and sections of the wood containing the burrows.)

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The Woolhope Naturalists' Field Club.

THE LONGMYND HILLS.

FRIDAY, AUGUST 19, 1870.

A friendly meeting of the Woolhope and Caradoc Field Clubs took place on Friday last in the beautiful valley of Church Stretton. A more interesting trysting place could scarcely be found. The narrow valley itself is rich and fertile, and the surrounding hills afford a fine field for botanical, geological, and archæological research. On one side are those bold hills Ragleath, Lawley, and Caer Caradoc, whose lofty and precipitous sides are surmounted by entrenchments which tradition attributes to Caractacus; and on the other side the valley is closed in by the fine range of the Longmynd hills, which it was the object of the day to explore.

The members of the Caradoc Club met their visitors at the station, and under the guidance of George Cocking, Esq., the route was taken from the railway station over the line and along the ancient Watling-street-road leading to Wroxeter (Uriconium, the principal city of the Cornarvii) to Kenchester (Magna castra) near Hereford. The little cluster of "Strettons," or "Street-towns" derive their names from their proximity to this old Roman road. On the present occasion it was followed for about a mile and a half to Little Stretton in pleasant discourse on things in general, and science in particular, with stoppings here and there, now to admire the scenery; now to discuss the formation and contents of a gravel-bed exposed by a railway cutting; or again to listen to a few remarks by the Rev. J. D. La Touche on the general contour of the Longmynd hills as resulting from glacial action, in illustration of the paper he was about to read on their summit.

At Little Stretton a Wych Elm on the road attracted attention. It was a fine luxuriant tree, and at five feet from the ground it measured 14ft. 2in. in circumference.

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Crossing the turnpike-road in the village, the Club proceeded to the opening of the Ashes Valley, one of those deep stream-worn dingles for which this side of the Longmynd is remarkable. Passing first some charming open glades of woodland, backed by the steep hill-sides, the valley became more and more contracted, until at length when the enclosures were all past and the ascent became more steep, scarce a footing could be found by the brook as it wound round the projecting masses of hill on either side.

Mr. Cooking, on reaching a quarry at some little distance up the dingle, called the attention of the members to the rock formation before them. The strata are almost vertical and of great thickness, indeed they were considered by the officers of the Government Survey to be of the immense thickness of 26,000 feet. There were some reasons for thinking that this estimate was greatly exaggerated. The apparent amazing thickness, for example, might be due, as has been thought, to the compressed undulations of folded strata, whose upper curves had disappeared under the influence of water and the glacial action, to which Mr. La Touche had just now alluded. Or, again, it might be explained by supposing that at the commencement of the elevation of the strata extensive longitudinal fissures were first produced, and that the forces which threw them up turned the separated portions on edge in a vertical position and parallel to each other, whilst the trap rock in its fluid melted state at once rushed in to fill up the intermediate spaces ; the result from such a process would certainly be similar to the appearance now presented by the rocks before them. Some years ago Professor Rogers, of New York, whom he had the pleasure to conduct up this valley, pointed out the appearances of curvature in the strata in this quarry, which seemed to support the theory of compressed undulations as explaining the wonderful thickness of these rocks. These appearances have however given way to the operations of the quarry-men, and the only way that remains to test the correctness of this theory, is as the rocks may become exposed from any cause, to note down carefully the occurrences of the purple beds and trap, and ascertain whether they are ever repeated in an inverse order (applause).

In the bed of the stream several spherical masses were observed, which, to the surprise of many visitors, were found to be canon balls. They had been fired from the battery at the target on the hill above, and had rolled down its steep sides to their present positions.

The day was most favourable for the excursion. A fresh breeze was blowing and the pleasant variation of sunshine and shade produced the most charming variety in the scenery around. At one spot, near the confluence of two small mountain streams, a halt was called, that the stragglers of the party might come up. Here, with the steep side of the Round Hill in full front, the beautiful tints of colour from light green and yellow to the richest autumnal hues of sienna and red of the Whinberry leaves, were exquisitely varied by the passing gleams of light and shade. On the adjoining hills the purple tint of heather

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was widely reflected, and immediately in the foreground the colour and shapes of the rocky shoulders of the hills, as receding in the distance they overlapped each other, completed a picture of mountain scenery that will not readily be forgotten by those who sat quietly by those murmuring streams to enjoy it.

A little diversion was now made by a few of the more scientific members to those beds of rock which are remarkable for preserving the traces of the *Arenicola* or Sand-worms, from that remote period of time when these hard rocks were soft sand. The traces are very abundant and there was no difficulty in procuring good specimens. Raindrop marks, too, are to be recognised by the faithful, and on one stone was the outline of what might seem to be a trilobite though it wasn't.

Leaving the palæontologists at work the members now began to ascend the mountain side, so steep, dry, and slippery, that they were only too glad to avail themselves of any portions of rock projecting through the surface, and willingly stopped from time to time to admire their purple colour, with a zeal for geological observation that anyway had its immediate reward in the restoration of breath and courage. By dint of perseverance the broad undulated service so characteristic of the top of the Longmynd range, "the table land" of Talford, was reached, and the "Pole"—a veritable pole—which marks the highest point, became visible. About half a mile of thick heather and whinberry bushes, knee deep, yet intervened, and by the time this was passed over, a higher appreciation was felt for the labours of the renowned Mr. Briggs on "his native heath." A lease of black game was flushed, and several brace of grouse were actually walked up from the heather, as they were enjoying their mid-day siesta. Hawks were observed too wheeling round high in the air, and Master La Touche caught sight of some ring ousels that breed in the dingles of the Longmynds.

The view from the Pole is very varied and extensive, but since on the present occasion, the distance was not very clear, we prefer to give a few hard facts presented by the Ordinance Survey.

The summit of the Longmynd itself is pronounced to be 1680 feet above sea level, and the principal hills seen from it, with their several heights, are as follows :—

		FEET.
Malvern	Worcestershire.....	1,395
Stowe Hill.....	Herefordshire	1,417
Cleeve Hill.....	Gloucestershire ...	1,134
May Hill.....	Ditto	973
Ashley Heath	Staffordshire.....	803
Axedge	Derbyshire	1,751
Mow Copt	Cheshire.....	1,091
Bardon Hill.....	Leicestershire.....	853
Cradle Mountain	Brecknockshire.....	2,630
Brecon Beacons.....	Ditto	2,910
Radnor Forest.....	Radnorshire	2,166

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		FEET.
Llandinam	Montgomeryshire.	1,898
Plinlimmon	Cardiganshire	2,463
Cader Idris	Merionethshire	2,914
Arran Fowddy	Ditto	2,955
Arrenig	Ditto	2,809
Snowdon	Ditto	3,571
Cym-y-Brain	Denbighshire	1,857
Titterstone Clee	Shropshire	1,754
Brown Clee	Ditto	1,806
Stiperstones	Ditto	1,650
Wrekin	Ditto	1,320

The wind was much too cold at the Pole to remain long there; and having transacted the ordinary business of the Woolhope Club, electing the following gentlemen as members: the Rev. Robert Bamford, of Little Dewchurch, Colonel Bridgwater, Coity Mawr, the Rev. G. H. Clay, Kington, and Dr. George, of Much Birch, a move was made to a spot on the southern side of the brow of the hill. The members here stretched themselves at length in a picturesque cluster on the heather, and protected by it from the wind rested and listened with much gratification to a lecture "ON THE GEOLOGY OF THE LONGMYNDS," by the Rev. J. D. La Touche; to a very interesting account of some original "OBSERVATIONS ON A WASP PARASITE," by Dr. T. Algernon Chapman, very eloquently given *vivâ voce* by Elmes Y. Steele, Esq.; and also to a paper "ON THE BEECH TREE IN HEREFORDSHIRE," by the Rev. T. Woodhouse, which created some little discussion.

The Pole was again visited, and the several hills kindly pointed out by Mr. La Touche to such members as only arrived there then for the first time. The road for Church Stretton by the Manor Hill was then taken. Very few visited the Battery, as they ought to have done, and the Oakham Dingle itself was very nearly omitted by accident. Greatly, however, to the relief of Mr. Cocking, who had so kindly provided the excellent route laid down in the programme, the mistake was discovered in time, and many were able to rectify it by passing down the steep side of the hill, and so enjoyed once more the ever varying scenery of a deep Longmynd dingle.

Near the bottom of the Oakham Dingle is the "Wishing Well," or the "Bishops' Well," as it has lately become the fashion to call it, from several Bishops having drank from its pure waters. It seems to want a legend, and certainly the water has in itself the merit of purity and excellence, though it may not perhaps promote all curates who drink of it to the Episcopal bench.

The way then led through the pretty rectory grounds, where the dingle is thickly wooded. Here the botanists were called upon to name an ill-smelling plant whose leaves had taken possession of a considerable patch of shady soil to the exclusion of everything else. It proved to be the Heart-leaved Valerian,

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Valeriana Pyrenaica, growing in luxuriance. This plant is doubtless an introduction but it has nevertheless established itself in the British Flora. It is found in many places in Scotland, but so far as the writer is aware, this is the only English locality for it. As it exists in the pleasure-grounds it is really a nuisance. Let the ground be carefully dug over in spring, and the thick rhizome be picked out, and future visitors to Church Stretton will be spared from many a horrid smell by this visit of the Woolhope Club.

There is in these grounds, too, an old stone coffin, found in some alterations that were made at the church, which gives the more ample scope to the ingenuity of archæologists, since it shows no sign or inscription to help towards its own history.

The hotel was quickly reached from the rectory grounds, and the visitors did good justice to the fare there provided for them. After dinner an eloquent paper "ON THE MORE RARE PLANTS OF THE LONGMYNDS" was read by Dr. Griffith H. Griffiths, M.D., the hon. secretary to the Worcester Field Club. It was not quite concluded when time was called, and amidst a few just but hurried compliments to the lecturer, the majority of the members rushed off to meet the train; and thus ended one of those enjoyable Field Club days in which all things went well, when fine scenery, beautiful weather, agreeable companionship, and clever scientific papers, combined to leave a pleasant record of the day in the minds of all who had the good fortune to be present.

The following gentlemen attended the meeting:—Jas. Rankin, Esq., M.A., President for the day; Chandos Wren Hoskyns, Esq., M.P.; the Rev. E. Donald Carr, Honorary Secretary to the Caradoc Field Club; Dr. Griffith H. Griffiths, Honorary Secretary to the Worcester Naturalists' Field Club; the Rev. J. D. La Touche; Dr. Bull; the Rev. James Davies and Mr. J. H. Davies; Arthur Armitage, Esq.; Robt. Lightbody, Esq., F.G.S.; Elmes Y. Steel, Esq., and Mr. Elmes Steel; Robert Lloyd Kenyon, Esq.; Thomas Cam, Esq.; George Harris Lea, Esq.; the Rev. Thomas West; John Lloyd, Esq.; Henry Gardner, Esq.; Folliot Sandford, Esq.; the Rev. George Sandford, and Miss Greene Armitage; Geo. Cocking, Esq.; Miss Hodgson; the Rev. Bernard Marshall; the Rev. W. C. Tabor; T. Curley, Esq., F.G.S.; Hy. Deane, Esq.; the Rev. J. H. Jukes; Marcellus Newton, Esq.; the Rev. T. Owen Rock; Dr. George; the Rev. W. D. V. Duncombe; J. P. Hamer, Esq.; the Rev. G. H. Clay; the Rev. Alfred James; F. H. Lyell, Esq.; Richard Wilding, Esq.; Mr. Harman, Mr. E. T. Husbands, Mr. John Andrews, Master W. La Touche, Masters Ernest, Alexis, and Henry Bull; and Mr. Arthur Thompson.

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ON THE GEOLOGY OF THE LONGMYND HILLS.

BY THE REV. J. D. LA TOUCHE.

It has been said that the fittest person to give a lecture is one who knows but very little of his subject. I suppose, because such a person is not daunted by its difficulties or the mistakes he may make—on the principle that "mortals rush in where angels fear to tread"—he dashes along on the strength of whatever information he can get together, and, unconscious, so to speak, of the shoals and rocks which embarrass a more skilful pilot, he brings his vessel triumphantly into port. According to this maxim you have before you a very efficient lecturer indeed; and on my part, I might fairly hope to win applause, but for one serious difficulty. The ignorant, though audacious, pilot *may* come across a rock, and as for me, I am conscious that my audience is one not satisfied with fluent words and rounded phrases: you are well accustomed to consider the subject on which I speak. Your frequent excursions, and the many excellent scientific papers which are from time to time read before you, have made the study of geology so habitual with you, that it is not likely that any rash assertion or conjecture will pass undetected.

And yet this thought should give me confidence, since assuredly the most important object of such efforts as these should be the determination of facts. It is, of course, a very important thing, at least to the speaker, that he should come well out of his ordeal and be considered competent and able and so forth; but I need not say that he has achieved a far higher victory if he has helped to elicit truth.

To come to the point. I am bound to say that the more I study the geology of the Longmynds the less inclined I feel to lecture upon them, that is, to suggest anything like a probable conjecture as to their history and the mode of their formation. It is comparatively easy to sketch the broad facts that they present to our observation, but when we attempt to reason on these facts we are met with many questions which present great difficulty.

The range of hills on which we are standing rises from the midst of an undulating country on both sides. These undulations bear an evident relation to this the central one. It is plain, on taking a glance over the surrounding country, that the lines of hills run generally parallel to that of the Longmynd. Such is the case with the Stiperstones and its subordinate ridges on the one hand, and on the other with the Caradoc, which rises in rivalship on the opposite side of the Stretton valley, and which is also accompanied by several lower

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lines of hills; and further off, the line of Wenlock Edge trending away to the N.W., like a sea cliff, and still further, the Clee hills. Even that distant ground has felt the force which has elevated this. The plane of the rocks of all that country, as a general rule, dips away towards the east, showing that an upheaval over the whole region, having its axis along this line, has taken place *since* their deposition. This observation is of importance as bearing on the comparative date of the elevation of mountain ranges in different countries, to which we shall have briefly to refer further on.

It would be entering into too wide a field to give, in any detail, an account of the surrounding Silurian strata, but it may be of interest briefly to state their succession. Our horizon is bounded on the east by the Clee hills, sole representatives of what was once an extensive elevated ground in that direction—for there can be no doubt that the coal strata with which they are capped extended between the two—that a continuous coal field covered all that tract, and that this has been denuded or carried away by long continued atmospheric action; but, in consequence of the outburst of a quantity of basalt with which they are crowned, the crests of these hills has been preserved intact, and with them all the strata beneath. Next in order, we observe the undulations of the Old Red Sandstone filling up most of the country intervening between the Clee hills and the long ridge of Wenlock and Aymestrey limestone; and nearer still, we can well study from this spot the various members of the Caradoc group.

So far the geology in this direction is tolerably clear and well defined, although here and there difficulties occur arising from local faults, yet on the whole the succession is so regular that this region has become as it were the index to that volume of the geological series, called the Silurian, throughout the world; but as we approach the base of this line of hills this regularity to a very great extent ceases. Faults become very numerous, and occasionally a sudden transition takes place from the earlier to the later rocks, and *vice versa*. In many places, indeed, we have the most recent brought into the closest proximity with the most ancient, so that it is with the greatest difficulty they can be disentangled.

As an instance of this great complication I would mention a portion of the Onny Valley. About Horderly you will find the Caradoc succeeded suddenly by the Cambrian, and this again brought into juxtaposition with the Wenlock strata, which you remember is a more recent formation than the Caradoc.

The usual means of accounting for such a fact as this is to say that it has occurred from a fault. It would almost seem, whenever a difficult problem of any kind occurs in geology, recourse is had to this hypothesis. I hope I may be pardoned if, with all possible respect, I would question the wisdom of making use so liberally of faults as means of explanation. That faults have played a most important and most extensive part in geology no one who knows anything about the subject can doubt. Their action is, indeed, marvellous, and

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unless we had the most conclusive proof of it, would be utterly incredible; still I believe that they should only be admitted to explain facts which are otherwise insoluble, and that we are often misled by starting with the hypothesis of a fault rather than arriving at it as a result of careful induction. Now in the present case I believe it would be an error to suppose that the sudden transition from the Cambrian to the Wenlock, in this locality, was the result of so violent a cause, for this reason, that we find the country at the base of these hills is covered with the Wenlock formation, and that up to a certain height along them it is unconformably deposited upon their upturned edges. This would argue that, subsequently to the deposition of the Caradoc, this immediate neighbourhood was submerged while the Wenlock rocks were forming. It is true that in other places the Wenlock and the Caradoc rocks are seen to be unconformable, but it has been shown that a particular stratum may continue its course of formation during many changes in the level of the pre-existing strata. It is to be particularly noticed that the base of the Longmynd hills, for a considerable extent on both sides, is clothed as it were with the Llandovery, and in their proper succession the Wenlock rocks, brought in, certainly not by a fault, but by the regular course of deposition. Along the southern extremity of these hills this fact is very striking—the relative position of the two bears all the appearance of an ancient sea beach, suggesting that during the Wenlock period the Longmynd stood up from the surrounding ocean like an island.

Now the conclusion arrived at by Sir R. Murchison is that during the chief part of what is called the Bala or Caradoc epoch there was no material interruption in the succession of the strata, but that a period of disturbance took place at its close, when the Llandovery commenced. This would coincide with what is observed here. It is, moreover, evident that as a rule the formation of a stratum takes place during the subsidence of the earth's surface. Layer after layer is formed and covered up by the detritus carried down by streams from the land. If, then, after the Bala formation over the surrounding ocean bed had taken place, this locality began to subside, we might naturally expect to find what is actually found, a shore-like deposit of rounded pebbles and sand along the higher ground, and farther out, in deep water, a more even and finer shale.

And this leads me to say a word on the conglomerates of the Longmynd, or rather those of the surrounding system of hills. A remarkable succession of these of different ages can be traced running parallel with their axis. To mention the chief—one of very marked character—extends along the eastern flank of the Caradoc for several miles. It can be traced from Cound, near Salop, in the north, and as far south as Corston, in the parish of Clunbury. At Frodesley it rises into a considerable hill, and also at Horderly forms the crest of a ridge. It is of much importance in correlating or determining the relative position of the strata in which it occurs. Higher in the series, though more intimately associated with the Longmynd, is the Llandovery conglomerate, to which I

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have before alluded. It is well displayed along the southern extremity, where it is associated with the well-known pentamerus bed—a dense mass of fossil shells, which is found in patches over several parts of the country to the west. Lastly, there are the conglomerates which are more closely connected with the Longmynd itself, an exact description of which I have been unable as yet to meet with. One of these is found along the north-eastern flank, and is prolonged as far as Sharpstones hill, near Shrewsbury. It is of marked character, and contains a large number of reddish fragments, as well as of quartz water-worn pebbles. The other is found along the south-western flank, and consists of a vast collection of well rounded quartz pebbles imbedded in a very hard and firm matrix. Many blocks of it may be seen projecting from the sides of the hill north of Plowden station, and are well worth further investigation. A continuation of it is met with in the gorges west of Church Stretton. What may be the exact thickness of this remarkable bed I am at present unable to say. From a walk over its site in company with Mr. Lyell and Mr. Lightbody a few weeks ago, we were inclined to the opinion that its dip and strike corresponded to that of the rest of the Longmynd, and it seemed probable that its thickness was considerable.

Can any geological fact be more interesting to contemplate than such a conglomerate as this? Here we see the debris of, as it were, a former world, of rocks which preceded these venerable Cambrians, inconceivably ancient as they are. Here are the most certain evidences that the same forces then as now acted, breaking up the previous rocks, and rounding them by attrition on the primæval sea beach.

I do not know whether it is a universal fact, but at any rate it is the case here, that the earliest deposit is almost wholly composed of quartz pebbles, while the later ones, such as that on the south of Longmynd, contains a large number of green and red fragments, probably derived from the Longmynd itself. Are we to draw any inference from this as to the nature of the pre-existing rocks? or are the quartz pebbles derived from the veins of that substance which they contained?

We must now for a few moments glance at the country to the west. The most notable feature in the foreground in this direction is the parallel range of the Stiperstones, with their projecting mass of quartz rock jutting forth at intervals from their crest. For a long time it was supposed that this series was the equivalent of the Lingula flags of Wales, but now it is admitted to be the lower portion of the Llandeilo group. It is found all along its course in this place to dip at a high angle towards the west, and as these Longmynd rocks do the same it is inferred that they are somewhat if not quite comformable to each other.

Such a fact would at first sight lead us to suppose that the Cambrians were immediately succeeded by the Llandeilos. But Professor Ramsay has shown clearly that such is not necessarily the case when two distinct strata are found conformable, but that it is quite possible that a long interval may exist between

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the time of their deposition. The older may have been above water, which of course would cause a complete blank in the record, and then after a lengthened period be again depressed, when a new formation would take place over its surface. Thus it is possible that the Lingula flags may not be represented here at all, while elsewhere in Wales they attain some thousands of feet in thickness.

But the relative position of the Stiperstones to the underlying Cambrians is of still further interest, as it has been adduced by Sir C. Lyell to answer the theories of M. De Beaumont, a French geologist whom he speaks of as "a skilful writer and an original observer of great talent and experience." I fear it would be impossible within the limits of this lecture to do justice to either side of the question which has thus been raised. Suffice it to say that M. De Beaumont's theory went to show that "in the history of the earth there have been long periods of comparative repose, during which the deposition of sedementary matter has gone on in regular continuity, and there have been short periods of paroxysmal violence during which that continuity was broken." The evidences of this paroxysmal action he saw in the upheaval of parallel mountain chains, which he inferred, from the position of the strata surrounding them, were uplifted at the close of each of the quiescent periods, and when a new order of animal life was about to be ushered in. This theory Sir Charles has examined with his usual care and impartiality, and has rejected, showing that although the inclination of a particular stratum clearly proves that the mountain chain on which it abuts has been upheaved since its deposition, and so that a fair inference as to the relative age of different chains may be made, yet that it is a gratuitous assumption to say that all animal and vegetable life was exterminated when such upheaval took place, or that any interruption even took place in the succession. "A striking illustration of the difficulties we encounter," he says, "when we attempt to apply the theory under consideration even to the best known European countries, is afforded by what is called the 'System of the Longmynds.' This small chain, situated in Shropshire, is the third of the typical systems to which M. de Beaumont compares other mountain ranges corresponding in *strike* and structure. The date assigned to its upheaval is after the unfossiliferous greywacke or Cambrian strata, and before the Silurian. But Sir R. Murchison had shown in 1838, in his Silurian system, and the Government surveyors since that time in their sections (about 1845), that the Longmynds and other chains of similar composition in North Wales are *post* Silurian. In all of them fossiliferous beds of the lower Silurian or Llandeilo flags are highly inclined and often vertical. In one limited region the Caradoc Sandstone, a member of the Lower Silurian, rests unconformably on the denuded edges of the inferior (or Llandeilo) member of the same group, whilst in some cases both of these sets of strata are upturned."

It would seem from these remarks that the upheaval of the Longmynds took place after the deposition of the Llandeilo, but before that of the Bala beds, of which they form a part. Now, no violent break can be affirmed to have

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taken place in organic life during the epochs represented by these two formations, and, therefore, this range of hills is a testimony that the most powerful dislocations may proceed concurrently with the ordinary course of nature; and such is, perhaps, the most important lesson to be drawn from Sir C. Lyell's volumes. The arguments he has accumulated from so many sources appear completely to dispose of the notion that the upheaval of such a mass of rock as we are now standing upon was a sudden event, or necessarily attended with violent disturbance of the ordinary conditions of nature. This very moment probably some infinitesimal movement is taking place in the rocks beneath our feet, which, giving time enough for it to act, would be obviously capable of producing any amount of change. When we look at the upturned edges, indeed, of these strata, when we find that at the very least computation they are some ten or twelve thousand feet thick, we are disposed to think that some mighty cataclysm must have thus dislocated them; but it is the function of true science to correct these random guesses, and to put aside any prejudices derived from previous notions by a calm examination of facts. Such a prejudice clearly exists in many minds. It is remarkable how many attempts have been made to establish the paroxysmal theory; yet can anything be more unscientific than to assign causes other than we have experience of, unless an absolute necessity compels us to do so.

With respect to the structure of the mass of the Longmynd hills: they consist of an accumulation of greenish-gray shales alternating in many parts with purple beds of the same lithological character, and with occasionally more sandy and quartzose rock. Their usual dip, when not disturbed by fault, is a high angle of some 70 or 80 degrees towards the N.E., and thus, in traversing the gorge from Church Stretton to the west, excellent sections are displayed, showing their enormous thickness. Whether any doubling over of the strata occurs in the flat table land of the summit is a question which has not been satisfactorily settled, but some good geologists think it probable, and so have reduced Ramsay's estimate of 26,000 feet to probably 12,000—a thickness quite sufficient, however, to fill us with wonder if we think of how long it must have taken to form. Imagine, *e.g.*, how long it would take to fill up the bed of the Atlantic to a depth of 2½ miles at the present rate of deposit.

These hills have, as has already been said, been the centre of several oscillations of the earth's crust. They were possibly above water when the Lingula flags were elsewhere being formed; they then sank into the depths of the ocean, to receive upon them the great mass of the Llandeilo rocks, which count, I believe, some 3,000 feet in this neighbourhood (it was perhaps at the commencement of this subsidence that the bed of conglomerate on their western flank was accumulated); then, while elsewhere the Caradoc was forming, they were upheaved into their present nearly vertical position. Then again came a period of subsidence, when the Llandovery conglomerate was formed along their southern and eastern flanks. What was their position during the sub

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sequent Devonian period it is not easy to say; but that they were again under water during the carboniferous period there is evidence to prove in the coal-field about Leebotwood.

The last submergence of the Longmynd would seem to have been during the glacial period. There are no facial marks here such as are met with in the Pass of Llanberis, Snowdon, Cader Idris, and other mountains in North Wales, from which it might be inferred that they were at this period submerged. And a strong confirmation of this is found in the planing off, so to speak, of all the higher portions of this chain of hills. This table land was at that time perpetually drifted over by huge icebergs, which, by their enormous weight, carried away all the higher portions. A similar action is going on this day over the banks of Newfoundland and the adjacent ocean bed. From the high mountain chains of Greenland, and from the Polar sea, great masses of ice, constantly detaching themselves and drifting southwards with the ocean currents, sweep across the banks, and so reduce them to a uniform level. It is quite consistent with this hypothesis that we find in some parts of this neighbourhood (at least I know of one place near Buildwas where such occurs) a quantity of travelled blocks, some of them of granite. They are the load which these glaciers once carried, and which sank to the bottom as they melted.

Subsequently to this period the Longmynd was with all this part of England elevated from the sea, and in the course of this its last upheaval was formed that vast estuary of the Severn, which extended from the Dee to the Bristol Channel. To this period must also be assigned those great mounds of gravel and sand which fill up many parts of the Stretton valley.

As for the organic life of the time when these hills were in process of formation, we have but the most meagre traces. Whether this is the result of peculiar circumstances, such as their geographical position, the climate of this part of the world at the time, or whether, as Sir R. Murchison supposes, the area of the Longmynds was really the infancy of the whole world of organisms, are not easy questions to answer with confidence. A few worm tracks are nearly all the unequivocal evidence we possess that any living creatures existed on these ancient tracts of mud and sand. Portions of trilobites are also said to have been discovered, but as far as my information goes they are very obscure. It may be noticed, however, that these traces, such as they are, prove positively the existence at that time of a flat sea beach, alternately above water and alternately submerged, since it is only under such circumstances that their preservation is possible. Rain marks and cracks in the mud caused by the heat of the sun's rays may also be found, also many good specimens of ripple marks. In rocks of the same age in Ireland a curious fossil, probably a kind of coraline, called *Oldhamia antiqua*, is found, but no trace of it has been discovered here. Negative evidence is always unsatisfactory. That particular fossils are *not* found in a certain stratum is no proof that they did not exist elsewhere at the time when it was formed. There are some organisms, such as e.g., the Lingula

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which are found in the earliest rocks, and which last to the present time. There is no reason to believe that there has ever been any interruption in their existence, and yet there may be strata in which they are unrepresented. Another interesting feature frequently met with in the lower portions of the Longmynd may be here noticed, and which those who avail themselves of the post prandial excursion to which they are invited in the programme of this day, may have an opportunity of observing. I mean the wave-like corrugated structure produced by lateral pressure along the plane of deposition, at the same time with great vertical pressure at right angles to it. No doubt this effect was produced when that great upheaval took place which raised these hills into their nearly vertical position.

Gentlemen, I have given, I fear, an extremely imperfect sketch of these interesting, these most venerable hills. They may well be called venerable, as they are the oldest of any of the formations with which we are acquainted in this part of the country. Their claim to the greatest antiquity is indeed now disputed by what is called the Laurentian series, which is said to be represented in the North of Scotland and at Malvern. Would that this subject had fallen into more skilful hands, for it is well worthy of a more careful and accurate investigation than I have been able to apply to it. The actual dimensions of the various strata, the position, nature, and thickness of the conglomerates which surround them, are within the range of patient measurement and calculation, and may we not hope some day will be fully elucidated.

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THE LIFE HISTORY OF RHIPIPHORUS PARADOXUS.

BY T. ALGERNON CHAPMAN, ESQ., M.D.

Rhipiphorus paradoxus is the only representative we have in this country of the *Rhipiphorides*, a sub-family of *Mordellidæ*, a family of Heteromerous beetles. It is nearly half an inch in length. It is narrowed in front and has the head bent down, so as to present some of that resemblance to a segment of an orange, which is so characteristic of the *Mordellidæ*. The elytra are short, pointed, and diverge from each other so as to exhibit the wings between them; in colour they are blue-black or yellow; the legs, especially the hinder ones, are long and straggling, the antennæ simple, or nearly so in the female, finely pectinated or rather flabellated in the male. The thorax has a curious depression along its dorsal aspect, and is hollowed out on each side at its posterior margin. The parts of the mouth are, to a certain extent, rudimentary; the mandibles are short and not toothed; the labial palpi consist of only one joint, and the lobes of the maxillæ are rudimentary. It is said to frequent flowers and to be attracted by the sap exuding from trees, but I have never seen it except in its real habitat, the nest of the common wasp, *Vespa vulgaris*, or of *Vespa rufa*. That it is to be found elsewhere follows from the fact that it leaves the wasps' nest as soon as it has completed its transformations.

Rhipiphorus paradoxus has long been known to be a parasite of the wasp (both of *Vespa vulgaris* and of *Vespa rufa*), and a general idea of its habits is given in an extract from the Papers of the Ashmolean Society, quoted by Mr. Frederick Smith, of the British Museum. After an observation to the effect that no one had hitherto observed any parasite attacking the ant, wasp, humble-bee, or hive-bee, the Rev. E. Bigge, the author of the paper from which the extract is made, observes, "As regards the wasp, however, it seems that this exemption does not exist; for though I myself have not been so fortunate as to find any specimens of ichneumon in their nests, one has been seen in them by Mr. Denison in several instances, and observed in all the stages of its growth. It is described by him as a fly, as large, or nearly as large, as the wasp itself; the head and fore part of the body black, the abdomen yellow, with a dark streak down the back; legs and wings black; upper wings dusky. This fly *(Rhipiphorus)* deposits its egg upon the grub of the wasp at the moment it assumes the pupa (i.e. spins or covers itself in the cell); as soon as the egg is hatched, it devours the grub of the wasp entirely, and itself assumes the pupa and imago form in the cell of the wasp."

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The first clearly recorded facts, however, that we have of the history of this curious beetle are the observations of the late Mr. Stone. In a paper communicated to the Entomological Society he says :—"On the 19th of August I was more fortunate; for on taking out a nest of *Vespa vulgaris*, and proceeding to open the closed-up cells, I found a larva of the parasite firmly attached to the full-grown larva of the wasp, the mouth of the former buried in the body of the latter just below the head, its neck bent over that of its victim, whose body appeared to be tightly compressed by that of its destroyer, showing the latter to be possessed of a considerable amount of muscular power. It was of minute size when discovered, and appeared to have only very recently fastened upon its victim; but so voracious was its appetite, and so rapid its growth, that in the course of the following forty-eight hours it attained its full size, having consumed every particle of its prey, with the exception of the skin and mandibles, which, from observations I have since been enabled to make, these creatures retain in their grasp even after they have passed into the pupa state. They scarcely appear to cease eating, except now and then for a minute or so, from the time they first begin to feed till they have become full-grown."

Mr. Andrew Murray was led by some observations he made in the summer of 1869 to call in question the facts of this history, and to advance the hypothesis that the *Rhipiphorus* was in its larval state fed up by the wasps as their own grubs are; in fact, that its life history differs from that of the wasp only in so far that a *Rhipiphorus* finally emerges from the cell instead of a wasp. During the present summer Mr. Murray himself succeeded in repeating the observations of Mr. Stone, and abolished all doubt as to the accuracy of the already recorded facts in the history of the *Rhipiphorus*. He has recorded his observations in the September number of the Annals and Magazine for this year, and I am enabled, by his courtesy, to append to this paper a copy of the plate with which he illustrated these observations. Up to this point it was assumed that the egg of the *Rhipiphorus* was laid in the cell with the wasp-grub, on which the *Rhipiphorus* larva fed, and Mr. Murray believed that he had seen such an egg, and has figured it (Figs. 1 and 2). At almost the same time that Mr. Murray made these observations, I had independently observed the same facts, and a further series of facts in the history of the beetle, that renders it one of the most curious in insect history, and compels us to classify *Rhipiphorus* with *Melŏe*, *Sitaris*, and *Stylops*, insects whose history is now tolerably well known.

Several species of *Melŏe* are well known (as Oil-beetles) being often seen in early spring crawling over paths on heaths and commons. They are large, heavy, blue-black, bloated-looking creatures, crawling slowly, and exuding a clear yellow fluid from their joints when disturbed. The female *Melŏe* excavates a large cavity in the ground rather over an inch deep and deposits in it several thousand small yellow eggs, which she carefully covers up. She repeats this egg-laying two or three times. After about three weeks, if the weather is fine, the young larvæ are hatched, and, escaping from the ground, swarm up the plants around,

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EXPLANATION OF PLATE.

Fig. 1. Section of closed cell with lid torn off, showing what I suppose to be an egg of *Rhipiphorus* near the mouth (slightly magnified).
Fig. 2. The supposed egg in fig. 1, more magnified.
Fig. 3. Wasp-grub taken from a closed cell, with a young *Rhipiphorus* fastened across its head.
Fig. 4. Wasp-grub taken from a closed cell, with a young *Rhipiphorus* in its most usual position, lying fastened across its breast like a baby.
Fig. 5. *Rhipiphorus* with wasp-grub nearly consumed; side view; magnified four times.
Fig. 6. The same; three-quarters front view.
Fig. 7. The same; three-quarters back view.
Fig. 8. Mature *Rhipiphorus*-larva after it has finished eating the grub; side view; magnified seven times.
Fig. 9. The same; front view; magnified seven times.
Fig. 10. Head of *Rhipiphorus*-larva, much magnified.
Fig. 11. The same, looking down on mouth, still more magnified.
Fig. 12. Mouth, showing mandibles looked-at end on.
Fig. 13. Mandible, side view.
Fig. 14. Legs, much magnified.
Fig. 15. The same, still more magnified.
Fig. 16. Cell of wasp, showing ordinary position of wasp's egg.
Fig. 17. Wasp-grub; back view; magnified four times.
Fig. 18. The same; side view; magnified four times.

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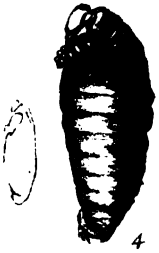
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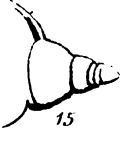
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especially finding their way in great numbers to the flowers. These larvæ are small yellow mite-like creatures, elongated, narrow and flattened, with long stout legs provided with simple claws, a short lateral seta to each abdominal segment, and two longer and two shorter hairs at the apex of the last segment. The spiracles of the third and fifth segments of this little creature are beautiful objects for the microscope. These extremely active little larvæ attach themselves often in great numbers to the bees that visit the flowers to which they have climbed, or indeed to almost any insect. When carried off by the bee, and each species of *Meloë* appears to attack only one species of bee, to its nest, the *Meloë* larva devours the egg of the bee, entering into its interior to do so; here it assumes a new form, being arched, cylindrical, with toothed mandibles and short stout legs. It now eats the store of pollen bread that had been collected by the bee for its own larva, and emerges in the following spring, but is yet lean and hungry-looking when compared with the beetle as usually met with, that is, after it has eaten abundantly of crowfoot, which it does most voraciously.

We shall see that the life history of *Rhipiphorus* is very similar to this, excepting that *Meloë* is essentially a vegetable feeder; *Rhipiphorus*, on the contrary, is carnivorous.

A sketch of the economy and life history of the wasp will be useful as an aid to understanding that of its parasite *Rhipiphorus*. Each nest of the wasp is founded in the spring by a queen wasp which has lived through the preceding winter, dormant in some hollow tree, or some other place suitable for hybernation. At first the queen, unaided, constructs the nest and comb, collecting the material of which it is made, and forming it into paper, and building with it the cells. She collects the food for and tends the young grubs, and continues to do this until she has reared a sufficient number of worker wasps to perform all these duties, after which she never leaves the nest, and merely lays eggs in the cells, which are afterwards entirely attended to by the workers. Until August or September, although the nest has been much enlarged, and may contain several thousand wasps, they are all workers, and no queens (females) or drones (males) are raised. The queens are reared in the most recently constructed comb, whose cells are much larger than the ordinary worker comb, but which differs from it in no other respect. Each layer of comb is begun from a centre consisting of a few cells, and is increased by additions to its circumference, and as eggs are laid in each cell as soon as it exists, the central cells contain the oldest grubs, until these have emerged, when eggs are again laid in them, and it may happen in this way in a large piece of comb, that the centre contains eggs for the third time, whilst the outer row has only its first series, and round the centre there are concentric circles of wasp grubs and pupæ of different ages. If we trace the history of an individual wasp, we find that the egg is firmly attached by one end to the inner angle of the cell. The newly hatched grub does not creep out of the egg-shell, but casts it as a very delicate pellicle. It does not completely leave it, however, but

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retains its attachment to the cell wall by its hinder segments remaining in a portion of the egg-shell, which is firmly attached to the cell-wall; and a considerable portion of the egg-shell may often be seen closely applied to the ventral aspect of the last segments of the larva. The grub casts its skin four times afterwards; so that there are five stages or sizes of the larvæ. In the first the jaws are destitute of brown corneous tips; afterwards the larvæ are only distinguishable by their size. I have seen the cast skin between each stage; it is always accompanied by the linings of the trachee, and a short lining is drawn out of the mouth. Unlike most other larvæ, in moulting, the head-covering is not cast as a complete corneous plate, but a mere skin is cast, as from the rest of the body, the only corneous portions being the brown jaw extremities, which are very distinct in each cast skin except the first, and serve readily to distinguish to which moult the skin belongs. All these are very slight, insignificant pellicles, except the last one and the one that is cast on assuming the pupa state. The greatest proportion of its growth is made by the larva after it has assumed its last skin. As the larva grows the wasps build up the cell-wall around it. When the larva has finished feeding, it voids a certain quantity of black matter, which forms a firm black cake at the base of the cell; beneath it are the four cast skins of the larva. I have examined this black deposit both before and after it is deposited, and I find in it no portions of insects of any size, though there are many minute particles that may be bits of chitine. It is, in fact, the effete material of the grub stored up during all its existence. The grubs are fed by the wasps with only fluid material: though the grubs work their jaws actively, they have very little (no?) power of biting or chewing. The larvæ of the hornet make a great noise by striking and scratching the walls of their cells with their expanded jaws. I take this to be a call for food. The black material is evacuated just before the grub begins to spin its silken covering; and this is the only time at which its alimentary canal is emptied. This is sufficiently proved by the store of black matter in the grub's interior increasing in quantity with the growth of the grub, and by the anal extremity of the grub being always enveloped in a cast skin; so that it is impossible to suppose that the wasps have removed anything. Excepting, then, the amount of excretion in the form of vapour, it follows that the wasp-grubs, from the egg to the perfect state, are actually fed upon an amount of material of only their own bulk.

When the alimentary canal is emptied, the larva commences to spin its silken covering; and now it is far from being such an inert larva as it has previously been: it moves its head actively to and fro to spin a silken dome over the mouth of its cell, and passes its head far down the cell-wall, to cover it with silk. Further, now its last cast skin is buried beneath the black deposit, it has no hold of the base of the cell by its anal segments; and being kept from falling out by the silken covering, it turns on itself so as to be quite folded at its middle; and I have frequently found such a larva completely reversed in the cell. Now there are two facts that prove, I think, that this

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reversal is not an accident, but the normal procedure of every wasp-grub :—first, that though I have found a number of grubs so reversed at this stage, I find none so at further advanced stages, as would be the case were it an accident; and, secondly, although in the case of *Vespa vulgaris* the silken dome and lining extends with any strength only for about a quarter of an inch down the cell, it extends almost to its base in a slighter form; and in the case of *Vespa Norvegica*, I find a strong silken lining quite to the base of the cell. Within this silk lined cell, which is in fact a cocoon, the wasp grub completes its transformation, and emerges by biting a hole in the silken dome, or cover. As each tier of comb is begun at the centre, so the wasps emerge first in the centre, then the next row and so on. As soon as the wasp has emerged the workers remove from the cell the cast skins of the pupa, and of the larva in assuming the pupa state, but they do not interfere with the black deposit at the base of the cell. They also remove the remains of the silken dome, and cut down the walls of the cell, probably to facilitate the laying of another egg and the feeding of the young grub when hatched. In this way several wasps are successively reared in the same cell.

I have already remarked that the wasp-grub has little more than its own bulk of food: this remark is equally applicable to both solitary and social bees and wasps. In the case, for example, of *Megachile*, the larva eats its store of pollen-bread, evacuates a few brown-black pellets (less in quantity than the black deposit of the wasp), spins a very thick and strong silken cocoon, and, after a rest of about ten months, completes its transformations, and emerges a bee of about the size of the original mass of pollen. Air-cavities within and a thick coating of hair, of course, aid in giving the appearance of no bulk having been lost.

So much for the history of the wasp grub, to return to *Rhipiphorus*. I succeeded on August 4, 1870, in obtaining a nest of *Vespa vulgaris* that was well tenanted by *Rhipiphorus paradoxus*, and easily ascertained that the larva of *Rhipiphorus* eats that of the wasp after the latter has spun up, and that the *Rhipiphorus* completes its transformations only a day or two after the surrounding wasps. I examined this nest with some care within a few hours after it was taken, and, though I observed many small larvæ, I failed to find any eggs. I was very fortunate in obtaining, a few days afterwards, two small nests which contained abundance of *Rhipiphori*, for the purpose of searching for the egg. My observations will, perhaps, be more intelligible if I throw them into the form of a life-history of the beetle; and this arrangement will show more clearly what points require further elucidation.

Rhipiphorus, then, doubtless lays her eggs somewhere, but where I am unable to tell. I first take up the history with the young larval *Rhipiphorus* at large in the wasps' nest, in a form not unlike that of the young larva of *Meloë*. It was in examining the first nest that I met with a solitary specimen of the larva in this stage. I examined it under the microscope, but neither figured it nor wrote a description of it at the time. Though it will be obvious, as I pro-

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ceed with the history, that this was undoubtedly the young larva of *Rhipiphorus*, and though the idea of such a possibility occurred to me at the time (and, in writing to Prof. Westwood on the point, I even suggested it), still I did not think it was so, and, not having too much time to spare, I passed it by. I am able, nevertheless, to give a tolerably accurate account of it. It is a little black hexapod, about 1-50th of an inch (·5 millim.) in length, and 1-120th of an inch in breadth, broadest about the fourth segment, and tapering to a point at the tail; a triangular head with a pair of three-jointed antennæ nearly as long as the width of the head, with legs very like those of *Meloè*-larvæ; the tibiæ ending in two or three claws, which supported and were obscured by a large transparent pulvillus or sucker of about twice their length; this was marked by faint striæ radiating from the extremity of the tibia, giving it much the aspect of a lobe of a fly's proboscis. Each abdominal segment had a very short lateral spine pointing backwards; the last segment terminated by a large double sucker similar to those of the legs; and the little animal frequently stood up on this, and pawed the air with its feet, as if in search of some fresh object to lay hold of. This little larva finds a wasp-grub suited to its taste, and makes its way into its interior. I believe, from once or twice finding a trace of a mark there, that it enters about the back of the second or third segment. But I do not know this, nor at what age of the wasp-larva it does so. I have, however, succeeded in finding the larva of *Rhipiphorus* within that of the wasp, before the latter had spun up. Assuming that the wasp-larva lives six days in its last skin before spinning up, I should guess that the youngest of these had still two or three days' feeding to do. The *Rhipiphorus*-larvæ were but a little way beneath the skin of the back, about the fourth and fifth segments, and indifferently on either side. The smallest of these (Fig. A.) was 1-16th of an inch in length, and, except its smaller size, was precisely like the larger ones I am about to refer to, having the same head, legs, plates, &c. These were of the same size as those of the larger larvæ, the difference in size of the latter being due to the expansion of the intermediate colourless integument. I ought perhaps to add that the nest in which I found these was not examined until twelve hours after I had taken it. It had also been so much blockaded by boys stoning it, that the wasps had not had free access to and from it for some time.

I next take up the history after the wasp-grub has spun its silken covering. By removing this covering from those most recently spun up, and extracting the contained wasp-larvæ from their cells, the larva of *Rhipiphorus* may be detected still in the interior of some of them. At the side and in front of the third and fourth segments (head being first) of the wasp-larva, the little grub of *Rhipiphorus* shines through the skin, being rendered visible by certain black markings on it—this part of the wasp being nearly transparent, and full of fluid bathing the newly forming limbs of the pupa. On extracting this larva (Figs. B. C.), it bears a general resemblance in size and outline to the youngest larva of *Rhipiphorus* that I had found feeding externally on the wasp-grub, but with the very notable exception of the already-mentioned

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EXPLANATION OF PLATE.

Fig. A. Larva of *Rhipiphorus paradoxus*, from the interior of a feeding wasp-grub, magnified 32 diameters: the small figures 1, 2, 3, &c. mark the head and dorsal plates, the latter being placed at the anterior margins of their several segments.

Fig. B. Dorsal view of larva of *Rhipiphorus paradoxus* when about to emerge from the interior of the spun-up wasp-grub, magnified 12 diameters.

Fig. C. Ventral aspect of the same larva. The figures refer to the segments as in figure A, the ventral plates being placed about the middle of each segment.

Fig. D. Dorsal view of head and dorsal plates of larva of *Rhipiphorus* (figs. B & C); the numbers refer to the corresponding segments of the larva; magnified 100 diameters.

Fig. E. Ventral view of head and ventral plates of the same larva, similarly numbered, magnified 100 diameters. The legs of one side are represented, numbered with their corresponding segments.

Fig. F. Leg, magnified 200 diameters.

Fig. G. Mandible of right side, magnified 300 diameters.

Fig. H. Dorsal plate of fourth segment, magnified 210 diameters, showing tessellated structure. Figs. D, E, F, G, & H are drawn from specimens mounted in turpentine.

Figs. I & K. Lateral and ventral views of the tracheal system of the recently emerged larva, magnified 14 diameters, showing the position of the spiracles and indications of the positions of the obsolete spiracles of the fourth and twelfth segments: *a* shows the appearance of a portion of the intestinal tube of the larva at this stage.

Fig. L. Full-grown larva of *Rhipiphorus paradoxus*, lateral view; enlarged 5 diameters.

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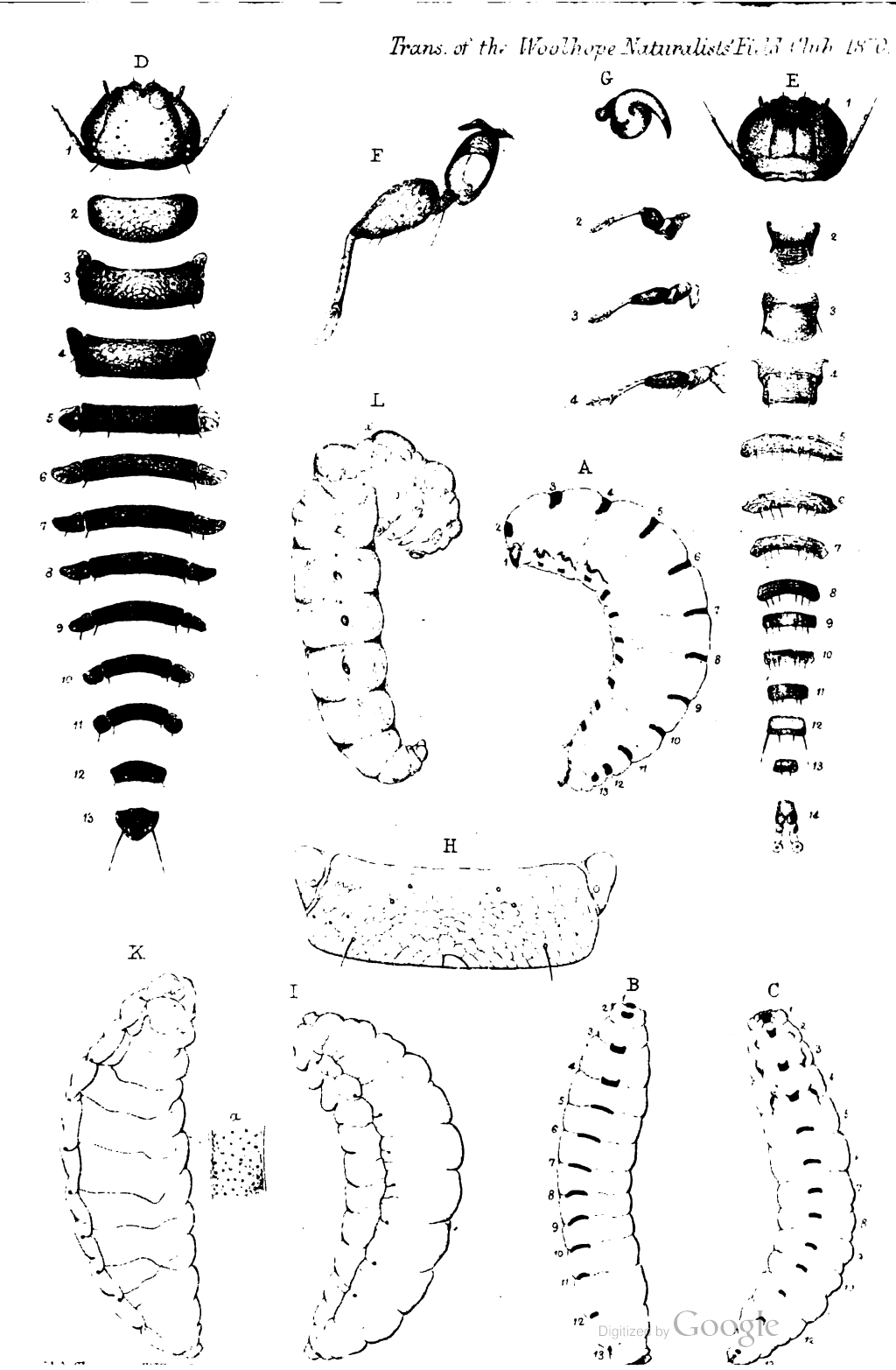

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black marks. These are in fact a corneous head, six jointed legs, and a dorsal and ventral series of plates. I immediately recognised the head and legs as identical with those of the little black mite already described, but presenting a ludicrous appearance in being widely separated from each other by the white skin of the larva. I have no doubt that the dorsal and ventral series of black marks are the corresponding plates of the mite-like larva floated away from each other by the expansion of the intervening membrane. By measurement also they agree exactly in size, although the larva extracted from the wasp-grub is ten times the length and six times the width of the little *Meloë*-like larva. In length it is ⅛ inch (4·5 millim.), and 1-28th in breadth. Except that its spiracles are not open, its respiratory and digestive systems look just like those of the externally feeding larva. The head (first segment) (Figs. D. E. 1.,) is black and triangular, with a pair of antennæ situated near its posterior lateral angles: these are three-jointed; the first joint is short, and supports a bristle beside the long second joint, the last joint being a long pointed seta. In front and above the base of each antenna is a pair (possibly more) of white eye-spots. The mouth and under part of the head are difficult to make out. There are a pair of strong jaws (Fig. G.), each shaped like a comma, with a large globular base and a sharp-pointed extremity. There are two four-jointed palpi, which seem to arise each from the front of a large rectangular piece, which is probably the maxilla. The legs (Figs. E. 2, 3, 4, and F.) still retain the sucker-disks at their extremities; they have very thick femora and narrow tibiæ*. The dorsal plates are twelve in number (making with the head thirteen segments) (Fig. D.); the first is of oval outline, flattened in front, and has two short bristles at its posterior angles; the second and third are larger, and have each a small subsidiary triangular piece at the anterior lateral corners; each has a bristle at the posterior angles; the fourth, fifth, sixth, seventh, eighth, ninth, and tenth are narrow, transverse, ribbon-like pieces, the anterior ones straight, the posterior ones curved; and each has a bristle at its outer end, and a secondary piece at each extremity, which also carries a small bristle: the fifth is the longest; and they become gradually shorter to the eleventh, which is a short quadrangular piece with a mere indication of bristles; the twelfth is triangular, with a long seta springing from below each side. The first ventral piece (Fig. E. 2, &c.) is nearly square, except that it is rounded behind and much hollowed out in front; the second is less so; the third is narrow antero-posteriorly, but of the same breadth; each of these has a strong spine closely adpressed and directed backwards near each anterior angle; the fourth to the tenth are narrow transverse pieces, slightly arched, with the convexity forwards, and each smaller than the previous one, and each with three bristles on either side near its posterior edge; the eleventh is oval, with two rather longer bristles at the sides, and two shorter

* A careful examination of a prepared specimen of the suckers shows them to be appendages of a three-jointed tarsus, in addition to which there are one or two claws (spurs at the extremity of the tibia?).

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ones between them; the twelfth is similar to but smaller than the eleventh, and with only short bristles; the thirteenth is immediately behind this and close to the extremity of the body; it consists of a rounded subtriangular piece, with its outer rounded extremities curled round so as nearly to meet, and a separate narrow piece at its posterior margin; from within the curled edges there proceed backwards two transparent processes, each with a disk-shaped extremity.

The dorsal plates are situate in the sulci, between the segments, the ventral ones about the middle of each segment. All these plates are of a delicately tessellated structure, as if constructed of flattened cells arranged in arches springing from their posterior margins (Fig. H. third dorsal plate); the femora have a similar structure, and, in a prepared specimen, I see that their dorsal margin is toothed where the different cells overlap each other.

These plates may be regarded as a beautiful display of the dermal anatomy of the little active larva; and the above description is doubtless equally applicable to it. In examining the little black mite-like larva I did not notice any setæ, except a short one at the side of each segment; these were probably those of the secondary dorsal plates. As a parallel instance of the separation of the chitinous plates of the dermal skeleton, I may refer to the case of the female of the white ant, as described by Smeathman, where he mentions the *Pulex penetrans* as the only similar instance known to him. I found more than a dozen of these larvæ within full-grown wasp-larvæ, and had the pleasure of watching three of them emerge from the wasp-grub. The usual, and, I believe, the only normal place to emerge is at the anterior aspect of the fourth segment (head = 1st). The *Rhipiphorus*, which is usually in motion, and for its situation might be called tolerably active, is seen to lay hold of the interior of the skin with its anterior legs, and keeps biting and scratching with its strong and sharp jaws until it is able to thrust through its head, when, in less than a quarter of an hour, it completely emerges by a vermiform movement; and at the same time it casts a skin, together wtih the black head, legs, plates, &c. Its anterior surface as it emerges is directed towards the head of the wasp, and, bending forwards as it emerges, and guided probably when in its natural position by the wall of the cell, it passes forwards as it emerges along the anterior surface of the wasp-grub, until its head comes somewhere near the second segment of the wasp on its dorsal or lateral aspect, where it at once seizes hold (Figs. 3 and 4). When removed from the cell, as those I examined were, the first few segments of the *Rhipiphorus* came directly outwards, though they equally succeeded in seizing the wasp-grub by the shoulder. The place of emergence is marked by a slight puckering, and by the black particles of the cast skin. There seems to be no escape of fluid from the wound thus made: for one thing, it is smaller than the diameter of the *Rhipiphorus*-larva, which squeezes through it and plugs it for the time; and afterwards it is to a certain extent stopped by the cast skin of the *Rhipiphorus*.

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The position of the *Rhipiphorus*-larva inside that of the wasp, when it is ready to emerge, is with the head to the point of emergence at the front of the fourth segment, with its body extending into the flanks of the second and third segments, and its ventral surface towards the skin of the wasp. The larvæ that I found in the still feeding wasp-grubs were clearly in the general cavity of the body of the wasp, among its fat-masses, &c., and not, as I imagined might be the case when I had only seen them in spun-up grubs, between the larval and pupal skins of the host. I may mention that when the young *Rhipiphorus* has emerged, the black markings of its cast skin are always easily detected in front of the fourth segment. All that I allowed to do so emerged within four hours of the taking of the nest; and, to take a round number, it seems probable that they do so within six hours of the spinning-up of the wasp-grub. This idea is confirmed by the fact that though all the still infested grubs had the dislocation of the larval head that occurs so soon after spinning-up, some had no trace of the pupal eyes, and others but a faint brown mark. I have described the *Rhipiphorus*-larva in this stage as being 4½ millims. in length, and I find I have notes of larvæ feeding outside the wasp of less than 3 millims. On emerging, the larva becomes shorter and thicker, and very soon loses length by that curving forwards of its head which is so marked in the full-grown larva, and which does not exist before its emergence. The young larva of *Rhipiphorus* is now found lying like a collar immediately under the head of the wasp-grub, and is attached to it by the head, though not very firmly. At this stage the feeding of the young *Rhipiphorus* is rather sucking than eating. In the case of a larva 4 millims. in length, the wasp grub was rather flaccid at the upper extremity; one of the pupal eye-marks had disappeared; yet there was no wound of any size in the skin, though very slight pressure caused fluid to exude. When we examine the mouth-apparatus of the *Rhipiphorus*-larva, we see that, though it must make a wound in the skin, its jaws are ill-adapted for anything like eating. As the *Rhipiphorus*-larva grows, its hinder segments pass downwards in front of the wasp-grub, and its mouth retains hold of the upper extremity of the was-grub. When it has grown to a length of about 6 millims. it casts its skin for a second time; and, so far as I have been able to observe, it only does so twice (the first time was on emergence from the wasp-larva). The skin splits down the back, and remains attached to the front of the larva, lying between it and the wasp. When the *Rhipiphorus* has grown as large as the diminished wasp-grub, the latter, partially eaten (for by this time some of the skin has disappeared), easily accommodates itself to the other occupant of the cell; and about this period the curving forwards of the head of the beetle-larva, hitherto well-marked, becomes extreme. Although there is still a good deal of wasp to be eaten, the cell from above (in natural position, of course, below) shows only the back of the thoracic segments of the *Rhipiphorus*-larva, the remains of the wasp lying in the space formed by the flattened front of the *Rhipiphorus*, from the sixth to the eleventh segments (Figs. 5, 6, 7). So far as tolerably close observation enables me to say,

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it seems that the wasp-grub entirely disappears, any portions held in the mouth of the *Rhipiphorus* merely meaning that the latter has not quite finished its meal; even the head and jaws of the wasp appear to be swallowed. The larva of *Rhipiphorus*, as it becomes full-fed, evacuates an insignificant amount in the form of a few small reddish pellets.

I can see no difference between the silken dome over a normal wasp-grub and that over a *Rhipiphorus*. I mention this not to show that *Rhipiphorus* does not spin it, which is sufficiently clear, but to show that it is not interfered with by the proceedings of *Rhipiphorus*, and that the wasp-larva is able to spin it as usual, although it is attacked before it has begun to spin. Nevertheless, although the silk is the same, as soon as the *Rhipiphorus*-larva has grown at all, the cell is easily detected. It looks decidedly whiter than the surrounding cells, from the larva or immature pupa of *Rhipiphorus* shining through. The larva of *Rhipiphorus* is much whiter than that of the wasp; and the pupa is quite white, whilst that of the wasp has two large brown or black eyes. As the time of emergence approaches, the *Rhipiphorus*-cell looks blackish or reddish as compared with the greenish tint given to the silk by the shining through of the black and yellow face of the wasp.

Ragged holes may frequently be observed in the silken dome covering the *Rhipiphorus*-cells. These are not to be found over those that are still small, but over full-grown larvæ and pupæ; they may frequently also be seen over healthy wasp-pupæ. They are evidently made by perfect wasps, who investigate everything that appears unusual in the cells, with the apparent object of removing a dead larva; at any rate, the presence of a living *Rhipiphorus*-larva seems to satisfy them as well as one of their own pupæ.

The wasp-grubs and pupæ always face towards the centre of the comb, those of *Rhipiphorus*, as follows from its mode of devouring its victim, always face in the opposite direction; they look to the outer angle of the cell, rarely to the one next it on either side. The perfect *Rhipiphori* emerge about two days after the wasps of the same row.

I do not know the time required by *Rhipiphorus* to go through these changes; it is something more than that required by the wasp from spinning-up to emergence; but what this is I do not know. That this is much less in the nest naturally than in the captive comb is almost certain, as the temperature of the nest is, no doubt, very high. In captivity it is twelve or fourteen days. Even this period is quite compatible with a larva of *Rhipiphorus* of about five millims. growing in two days large enough to fill up the top of the cell, as we see it does before it is full grown; and this was doubtless what Mr. Stone saw, as the *Rhipiphorus*-larva becomes a pupa at about the middle of the period of twelve or fourteen days mentioned above.

In connexion with this very rapid development of *Rhipiphorus*, the following fact is very interesting. Many larvæ, when about to assume the pupa-state, present obvious indications of the eyes of the imago beneath the skin of the second or even of the third segment. This, we have just seen, occurs in

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Vespa; and on this, with some other facts, Ratzeburg founded the remarkable, though untenable, theory that the head of the imago was the first and second segments of the larva combined. In reality, the rapidly developing head leaves its previously too small quarters, and finds room by pressing backwards the other parts beneath the effete skin; and having done so, the various parts of the head, and first of all the eyes, begin to show themselves as development proceeds. In most insects this is a process involving several days; and the distortion caused by the head taking up its new position is very evident long before any trace of eyes is visible; nor is any change observable until after the larva has done feeding. Having examined a full-fed larva of *Rhipiphorus*, I observed, as usual, those eye-spots placed well back in the second segment. But I was much surprised, on examining a larva that was still feeding, to observe the eye-spots within the head of the larva, showing that the eyes of the imago were beginning to develope, both before the larva had done feeding and before the imaginal head had assumed its larger dimensions. These eye-spots consisted of a patch of little brown pigment-points—one for each facet of the perfect eye.

The young external larva (Figs. R. I.) is semitransparent, with none of the masses of white fat that obscure the interior of the full-grown larva, and render it white and opaque. Each of the first five segments after the head, presents two large dorsal prominences, one on each side; and the tracheal system and intestine can be easily made out. The latter is a large simple sac, pale yellow in colour, with numerous circular markings and rounded dots, and is in continual rhythmic movement. The tracheal system is very like that of other Coleopterous larvæ; it is probably the same in the full-grown larva, as the positions of the spiracles are the same. From the first to the second spiracle the lateral trunk is double; and about its middle is a short branch, the abortive second thoracic spiracle: the only difference from the Coleopterous type is that there is no spiracle in the twelfth segment; but there is a distinct short tracheal trunk running towards the skin to represent it.

The full-grown larva (Figs. L. and 8, and 9) has a very close superficial resemblance to a *Crabro* or *Pemphredon* larva. It is 11 millims. in length (this is from the fourth to the twelfth segment); from the jaws to the last segment it is dorsally 21 millims., but ventrally 8 millims.; its lateral diameter is 4½ millims, its antero-posterior 2⅔ millims. It is therefore much flattened; and this flattening is chiefly in front. The head (Figs. 10, 11) is very small, and curved forwards so as to be almost out of sight, the front of the head being directed rather towards the body of the insect than directly downwards. It possesses a pair of triangular jaws (Figs. 12 and 13), produced at the apex into an extremely sharp point. There is a transverse line beneath these; and there are eminences, that may be called labrum, maxillæ, and labium; but I cannot determine the actual mouth-opening or any other apparatus, except that a to-and-fro sucking-movement is observable among the contents of the head. The second segment is rather large, and possesses dorsally a large trefoil boss on either side; it is in the front part of this that the eye-spots are

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visible when they have quitted the larval head. These bosses are separated from the head by a narrow smooth surface; a small lateral tubercle intervenes between them and a lateral or ventral process. A similar lateral or ventral process belongs to each of the two following segments; and I may describe them together (Figs. 14 and 15); each extends laterally, is conical and somewhat pointed, and is divided by constrictions into three portions. As they are also distinctly anterior to the lateral tubercles proper, I think they must be called legs, although they possess no corneous plates or claws, and are in fact of the same pellucid structure as the other tubercles; they appear to assist, passively rather than actively, in holding the wasp-grub. The third and fourth segments have each two large dorsal bosses or tubercles, with two smaller ones beneath each, and an indication of a lateral tubercle. The fifth and sixth segments have similar but less marked dorsal tubercles. All these segments are much narrowed ventrally. The sixth with the following segments form the longitudinal portion of the body of the larva; they are much compressed from before backwards, this being most marked in front. Though nearly plain at the actual dorsal ventral and lateral lines, the segments are deeply incised in front and sometimes behind, though this is not marked behind in a plump larva: these segments have an indication of dorsal tubercles. The twelfth segment is smaller than the others, and is very narrow in front, as the last segments curve forwards and upwards; the thirteenth, still smaller, appears to be divided into two, and there is, in addition, a very distinct rounded anal tubercle. The dorsal vessel is a straight hiatus between the masses of white fat, and, though it is not so, looks not unlike a groove; and in a larva preserved in spirit the skin might readily shrink into it and actually make it one. Except the tubercles, dorsal vessel, and some of the intervals between the segments, the body is full of white fat disposed in small rounded convoluted masses. The spiracles are eight in number on each side: the first is near the anterior border of the third segment, about half way between the dorsal and leg tubercles; the second is just above and in front of the lateral tubercle of the fifth segment; the others are in the six following segments, in a little hollow behind the lateral projection, and near the anterior part of the segment. The twelfth segment has a similar hollow, but no spiracle. In the third and fourth segments there are seen very early a pair of tracheæ on the side of each, which indicate the wings and elytra already forming.

When it emerges, *Rhipiphorus* is nearly as large as the wasp whose place it has usurped, although not quite, and, like the wasp itself, has fed on a mass of food but little exceeding its own bulk: curiously illustrating this is the long known fact that the *Rhipiphori* that emerge from queen cells much exceed in size those that emerge from the cells of the workers, without reference to the sexes of the beetles so emerging,—males as well as females emerging from the queen cells.

The point which most requires investigation is the place and manner of oviposition of *Rhipiphorus*. As the young larva is active, it is by no means

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necessary that the eggs be laid in the nest of the wasp; and I have never found a *Rhipiphorus* in any of the numerous wasps' nests I have examined, except such as had recently emerged from the cells. I have found the larvæ, also, very abundant in some nests, in others very scarce, only two or three sometimes in the whole nest. Were the eggs laid in the nest, they should always be either abundant or absent. I do not know it from my own observation, but I believe that the perfect beetles hibernate, wherefore the eggs must be laid in spring and summer. I have in vain, however, caught and examined many wasps at large, in the hope of finding them infested by young *Rhipiphorus*-larvæ, as the *Andrenæ*, &c., are by those of *Meloë*. In determining the oviposition, the young larvæ would incidentally be obtained in large numbers. All other methods I have tried to obtain more than the one I accidentally met with have failed. I intend to secure as many perfect *Rhipiphori* as I can, and to try to keep them over the winter, in order, if possible, to obtain the eggs.

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THE BEECH TREE IN HEREFORDSHIRE.

BY THE REV. THOMAS WOODHOUSE, M.A.

The beech is widely distributed over Herefordshire, but nowhere common, perhaps nowhere indigenous. There is the same difficulty in this as in other cases, in distinguishing between those trees and plants which are the native growth of the country, and those which are but the descendants of cultivated and exotic kinds.

The difficulty is increased in the case of the beech by the great readiness with which it produces seedlings. Of the countless multitudes of seeds which every beech scatters round it every year, some must germinate; and those which spring up under favourable circumstances grow fast, and soon produce fresh seeds in their turn. Singularly enough the shade of the beech itself is unfavourable to vegetation; and consequently no seedlings come to maturity under the spreading branches of the parent tree. But for this, a beech grove would soon become an impenetrable thicket, instead of the cool and "pillared shade" which it is now.

The only places where I know of anything like a beechen coppice are on limestone soils. There is a wood at Aymestrey, once common, but long enclosed, which has received the name of Beechen Bank, from the abundance of small beeches intermixed throughout it. This is close above the great quarry—a quarry of limestone. And if I remember aright, beech abounds just in the same way on the hill above Walford, close on the outskirts of the Forest of Dean, also on limestone.

These two instances occur almost at the opposite extremities of the county; and it is probably owing to the absence of calcareous soil in other places that beech woods are not more common.

This is exactly what one might expect. The beech woods in Buckinghamshire and Hampshire, still very extensive, though much reduced in size, are on the chalk hills, especially where Chiltern

> With his beechen wreaths this king of rivers crowns
> Amongst his holts and hills as on his way he takes.
>
> —*Drayton.*

On the Cotswold hills, about Tetbury, beech also thrives abundantly.

Beeches of great size and beauty, and manifestly planted, are to be found in all parts of Herefordshire. Few trees were so highly valued by our forefathers, or turned to so many uses. Many articles which are now made of

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other materials, especially of iron and pottery, were formerly made of beech wood, and no fuel was more esteemed. It has been found too perishable to be really good for timber; and one reads with a smile of something like incredulity the praises formerly lavished upon it.

Evelyn, in his "Sylva," has much to say in its praise; and he does but echo and corroborate what had been said long before. The ancient poets delight in it. Virgil makes his shepherds drink out of beechen bowls. Carved bowls of this kind are the prize of the rival singers in the third eclogue.

Pocula ponam
Fagina, cælatum divini opus Alcimedontis.

—*Virgil, Eclog.* 3, 36.

Two bowls I have, well turned, of beechen wood:
Both by divine Alcimedon were made.—*Dryden.*

And when in the first Georgic he directs the farmer to provide himself with proper implements, beech is mentioned among the materials of which they are to be made.

Cæditur et tilia ante jugo levis, altaque fagus.

—*Virgil, Geor.* 1, 173.

Of beech * * * the bending yoke,
Or softer linden.—*Dryden.*

It was even employed in shipbuilding, especially in the keels of ships and the oars of galleys.

So Claudian:

Si qui vecturus longinqua per æquora merces
Molitur tellure ratem, vitamque procellis
Objectare parat, *Fagos* metitur et Alnos.

It seems, indeed, that beech-wood is really more suitable for such purposes than for others. Loudon says that keels of vessels are often made of it. Experience shows that it is more durable in damp than in dry situations. Mill-dams, sluices, piles, and the outer parts of mill wheels, are, according to the same author, often made of it.

But it is to smaller articles and less important uses that it is more commonly applied. Bedsteads and chairs are made of it in large quantities. Our forefathers made their wooden trenchers and platters of it. But it is held in small esteem; and in Herefordshire, at any rate, is seldom used for any but the roughest and commonest purposes. The golden days of unsophisticated simplicity are gone: the good old times were over, when

Hinc olim juvenis mundi melioribus annis
Fortunatarum domuum non magna supellex
Tota petebatur; sellas armaria, lectos
Et mensas dabat et lances, et pocula fagus.

—*Cowley, Pl.* 1, 6.

The days are gone (if they ever existed)

When beechen bowls on oaken tables stood;
When temperate acorns were our fathers' food.

—*Tibullus,* 11, 9.

Another more important use of beech-wood is gone too. It is no longer used in any large quantities for fuel. Many parts of the kingdom had formerly very little else but wood to burn; and they valued beech-wood especially, for

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the brisk fire it makes and the great heat it casts out. It is in chimneys where the smoke of beech-wood continually ascends that the Hampshire people cure their excellent hams; and in Hampshire, since the introduction of coal fires, places have been made on purpose for smoking bacon with the smoke of beech-wood—a sort of kilns.

Thus coal, and iron, and earthenware have ousted the beech from most of its former uses. Its use may be gone. Its beauty remains. It is, and always must be, one of the greatest ornaments of the landscape. As such in Herefordshire we must certainly regard it. I cannot understand the objections that Gilpin brings against this tree. He does not even allow it to be a timber tree at all. He calls it an over-grown bush. He says it is "heavy," and lumpish, and "disproportioned." He compares it to the elm only to condemn it by the contrast. Now, surely this is very unfair. The beech is not an elm any more than the elm is an oak. It has a character of its own; less stately, doubtless, and less aspiring, but far more flowing and graceful.

Its long pendulous branches sway in the wind, casting a broad and pleasant shade. Its smooth trunk sometimes rises to a great height, unbroken by branches, more commonly it sends off long slender limbs. Its foliage is glossy, seldom attacked by insects, of a tender green in spring, and in autumn varied with many tints of golden brown.

An old beech tree, especially if on an exposed spot, attains the same sort of picturesqueness as the oak itself. Its limbs are broken, and stand out boldly towards the sky. Parts of its foliage become compact and lean away from the direction of the prevailing wind; giving an irregularity of outline which is far better than the formal and balanced harmony of the elm or the lime tree.

Many trees have but little beauty when they are young. Young oaks especially have a cramped ungraceful mode of growth, angular and ill-balanced, or else shapeless and bushy.

With the chestnut the case is much the same. But a young beech is one of the most beautiful of trees. In its airy lightness it almost rivals the birch itself, and the flowing curves of its lower branches are particularly graceful.

Not that every beech is alike. On the contrary, no one can notice a group of beeches without seeing individuality of character among them. One is more stiff in its growth, another more bending; one has foliage of a lighter shade, another of a darker, and so on. And these differences are still more marked in spring and autumn than at this season. One beech tree may be in the full freshness of its first leaf, when another close by, in the same soil and situation, is still much what it was at Christmas. Some shed their leaves early, others retain them far on into the winter. This is especially the case with trees that are cut or clipped. Beech hedges are not in vogue in Herefordshire; but they, like the hornbeam, form a very effective screen, and always look neat. They are particularly well adapted for sheltering gardens from cold winds—less

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so, indeed, than the holly, but much more easily and quickly obtained. The brown leaves linger on them all the winter through, and do not fall till the young leaves come again. It will be seen, therefore, that beech are particularly suitable for ornamental planting. They harbour less damp than other trees. They are available at all ages and in all situations. The ground under them is always dry and free from weeds. No trees are so pleasant to sit under, and so it has been always thought ever since the day when Virgil's shepherd rested

Beneath the shade which beechen boughs diffuse.

Eclog. 1, 1.

There are two varieties of the beech which deserve a passing notice—the Purple and Fern-leaved or Feather Beech. Loudon speaks of the latter as more curious than beautiful. I venture to think it is both. It is a tree that grows freely and rapidly, forming a compact mass of foliage of somewhat pyramidal shape, each leaf being deeply cut, sometimes even to the midrib, not at all unlike the fern to which it has been compared. It bears cutting as well as the common beech. I saw one a few days ago, which had leaves of at least three distinct types; some simply shaped like those of the common beech, others reduced to mere shreds and strips of leaf.

The Purple or Copper Beech is more common. It grows very freely, and has long pendulous boughs, which are very graceful. The contrast it affords to ordinary foliage makes it very ornamental.

It is as ornamental timber that the beech is generally to be found in Herefordshire; and it now remains for me to notice some of the most remarkable trees that I have met with in the county, and to give some particulars both of them and of others of which I have received accounts.

At Croft Castle there are great numbers of beeches. A beech avenue leads up to the castle on the east, more than half a mile long; and very fine single trees are to be met with in the grounds. Among those in front of the castle, between it and the road, are one of 14 feet in girth and two above 15 feet at 5 feet from the ground. These are handsome, shapely trees, rising to a great height, and covering a wide extent with their ample foliage. In the trench of the British Camp, which crowns the Ambury, the hill behind the castle, there are a large number of very fine old beech, one of them 15 feet in girth, and the others not much less. These trees mostly rise with clear single trunks; but it is very common to find two or more trunks forming apparently one tree. In such cases the separate trunks sometimes grow together again above, at some point of contact. Loudon gives two very good figures of such trees; and I well remember that when I went to Selborne, now many years ago, I saw on the Hanger there a very curious instance of the kind, of which I made a memorandum at the time, which I have now before me. I mention this because this tendency makes it difficult to say what is the girth of some beech trees. Are you to reckon two closely-adjoining trunks, springing from the same root, as one tree or as two? If as one, you must measure nearer to the ground than our regulation 5 feet; if as two, you treat one very fine tree as

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two ordinary ones. There is an instance of this on the Croft estate. At the top of the wood called Pokehouse, overhanging Aymestrey, there is a beech with two trunks, the one measuring about 12 feet in girth, the other about 10. It is obvious that to call this two trees is rather straining a point; if it is considered one tree, it is one of the very largest in the county. Another tree on the same estate and in the same wood, more immediately above the church and village of Aymestrey, has one clear trunk, about 15 feet in girth. This is the tree on which former generations of Lucton boys used to cut their names; but I suppose the custom is extinct, for when I visited it a few weeks since I found the well-remembered initials of my old school-fellows, but very few recent names. The newest of all was not completed. The beginning was suggestive: it was

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which certainly looked more like the beginning of the name of some fair maiden than of a rough schoolboy, perpetuating his own name by means of his pocket-knife.

Beeches have always been favourites with love-sick youths for this very reason. From the golden days in which Virgil's shepherds sang their responsive strains, and carved the name of Amaryllis or Galatea on the smooth beechen bark, down to the present, this has been an easy mode of testifying devotion. One smiles to see such a quaint allusion to the practice as that of Phillips, where speaking of a Herefordshire worthy, the great Lord Treasurer Harley, he says, addressing his muse:

> Acknowledge thy own Harley; and his name
> Inscribe on every bark; the wounded plants
> Will fast increase, faster thy just respect.
>
> *Philips, Cider*, 1.
>
> —— Crescent illæ: crescetis amores.
>
> *Virgil.*

The mention of the great name of Harley, long illustrious, now almost extinct, reminds us of their ancient seat of Brampton Brian. There grow the finest beeches I have ever seen. There is one group of very large ones near the cottage in the park, but some others still larger in a sheltered hollow further up in the recesses of the hill. One of them is dead, but the trunk still remains firmly planted in the ground. It seems to have been broken short off by the wind about four or five feet above the ground, perhaps more: it still measures 17ft. 3 in. in circumference. Several other of the finest trees seem to have suffered almost the same fate in former years: they grow up in a huge and massive trunk to eight or ten feet high, and then throw off huge and very long limbs. In one case an old stump has thrown up a new trunk, so tall and vigorous that by itself it would constitute a fine tree. Many of the beeches there are of wonderful height and size; and one that I measured lately is 19 feet in girth. I made another 21 feet, but that was measured rather lower down. I should mention that it is almost impossible to be exact in such measurement on account of the irregularity of growth in the trees, and the steep slopes on which they grow.

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At Shobdon there are a great number of beeches, but few of any size. Most of them are healthy vigorous trees of 50 or 60 years old, but there are one or two larger ones—one of 16 feet 9 inches in circumference, and one near the house which rivals the Brampton Brian trees themselves. I am informed that it is 19 feet 8½ inches in circumference, and is a healthy well-grown tree. There was formerly a very large beech on the Shobdon Court estate, which for regularity of outline and beauty of growth is seldom equalled, but it was blown down last winter. It measured 16 feet in girth.

The annexed table gives some further particulars :—

Situation.	Circumference.	Date of observation.
Brampton Brian Park	21ft. 0in. ...	July 25, 1870.
Shobdon Court Garden	19ft. 8½in....	1870
Brampton Brian Park	19ft. 0in. ...	July 25, 1870.
Shobdon Court, The Hayes	16ft. 9in. ...	1870
Brampton Brian Park	16ft. 6in. ...	July 25, 1870.
Croft Castle, ground in front	15ft. 10in. ...	1870
Ditto, Ambury	15ft. 0in. ...	1864
Ditto, grounds in front...	15ft. 1in. ...	1870
Ditto, Pokehouse	15ft. 0in. ...	1870
Ditto, grounds in front...	14ft. 1in. ...	1870
Ditto, Ambury	14ft. 0in. ...	1864
Ditto, grounds in front...	13ft. 8in. ...	1870
Ditto, Ambury, and grounds in front too.....	13ft. 3in. ...	1870 and 1864.
Holm Lacy Park	12ft. 11in. ...	1866
Stoke Edith	12ft. 3in. ...	1866

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ON THE MORE RARE PLANTS OF THE LONGMYNDS.

BY GRIFFITH H. GRIFFITHS, ESQ., M.D.,

Honorary Secretary of the Worcester Naturalists' Field Club.

We are all more or less struck with the great extent, variegated aspect, the utility and beauty of the clothing of our globe.

Yes, on "this green ball floating through the heavens," from the gigantic *Adansonia* to the hyssop on the wall—from the proudest palm to the microscopic moss—the distribution of vegetable life is scarcely arrested by height or depth.

Forests of beech wave on the Himalayas, fourteen thousand feet above the summit of hoary-headed Mont Blanc. Deep in the unfathomed ocean, Algæ lave their olive-tinted fronds. Melville Island, with its long, dreary night of winter, has its saxifrage and ranunculus, powdering like sunbeams those thrilling regions of thick-ribbed ice. The boiling waters in Iceland, the hot springs of Arabia, have their appropriate Confervæ, while the minute *Protococcus* lives in and enlivens with its glow the Polar snows.

Last year my colleague, Mr. Lees, found in some hailstones which we gathered in a pelting storm, mycoderms present *in integro*, awaiting, probably, some more genial *nidus* for their due elaboration.

Perched on the tufa of extinct craters, we are told, the *Cyperus polystachus* loves to dwell, which for aught else is bare and desolate (Humbolt's Cosmos).

The subterranean cavern has its peculiar tribe, for here the *Schistostega pennata* (which I have brought for exhibition) reflects in the minute filaments of its protothallus the faintest light reaching the caves in which it likes to grow.

Earth, air, and water, the rudest relic and most sterile spot, nay, plants themselves, have their respective epiphytes in varying ratios of development and strict adaptation.

The multiplicity of such objects renders it the more desirable to study the laws affecting their distribution, so as to perceive the regular and successive operation of certain influences, and in the "Longmynd Flora" we have an opportunity of singling out the equivalents of different types of plants and vegetable structure, and so to gain an insight into the character and connexion of natural phenomena. For this purpose it will be necessary to glance at

1. The physical peculiarities of the Longmynd Hills,
2. Their vegetable physiognomy, and
3. The natural history of such vegetation.

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Now it will be found that the character of each species of plant is more or less affected, and its distribution limited by certain physical conditions acting on and through those powers of adaptation or special vital endowments which undoubtedly vary even in species of the same genus. This special constitution, then, will be more conspicuous in a limited area, neutralised by other and more complex agencies incidental to a wider field of distribution; hence we find "the most striking varieties are found in those families which are capable of the widest geographical extent."

In speaking of the temperature, &c., of a range of hills sixteen miles in length, we should require a very accurate measure of the sums of summer heat and the minima of the colder parts of the year, with hygrometric observations, extended also over many years, to deduce any very definite rules to guide us in the vegetable topography of such a surface; but we can approximate, for doubtless each plant has its special zero. We find, accordingly, classified to hand, certain montane species, then next, others locally ascending, and a third division spreading throughout or descending to the plains below; though in some cases their head quarters may be on the heights and slopes. I repeat, on this head we can approximate merely, for as yet we have no precise physical formula determined on jointly by meteorologists and naturalists to express the effect of moisture on organic life. The main temperature of the air, as we ascend from the vale to the hills, sinks at an average rate of about one degree Fahrenheit for every hundred yards, the lowering being in maxima than minima, and the ground mean temperature falling less rapidly than the aerial mean.

The proximity of large masses of land, and the distance from the sea, are other factors which impress a certain character on the winds sweeping over the table lands of these hills, contributing to make the harvests later here than they are in other counties more favourably situated in this respect.

Mr. Carr has kindly favoured me with the average rain-fall, collected by himself, from observations in this neighbourhood, over a space of five years; and, looking at this return, I think it may fairly be stated that the rain-fall is not so much as we should *a priori* expect in a mountainous neighbourhood, though, from the accounts of some visitors who do *not* consult their weather glasses before coming *here*, Jupiter Pluvius would seem to reign supreme.

The absence of any large body of water or morass, the arid nature of the subsoil, and the fact of the vale of Church Stretton itself being at a considerable elevation above the sea level, are favourable to rapid radiation after rain and a comparatively dry atmosphere.

The petrology of the Longmynd strata, or the mode in which their constituent particles are combined, has, in some situations, a greater influence on its vegetation than the mere lithology or class of rock, in the comparative facility or resistance of abrasion occasioned by such differences in the intimate structure. Where we find the silicco-aluminous texture and hard con-

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glomerates in the masses of the Longmynd, we encounter in such situations the dry-loving species (or those of the Germanic type) among the more characteristic montane species. On the other hand, where the argillaceous schists predominate, or the quartzose particles of the Lower Silurian rise beneath the argillaceous covering, the soil, cold and humid generally, in dry weather forms an arid, parched crust, covered with heath and moorland, which thus restricts the area for the growth of some montane species, while the bleak, ungenial winds exert a dwarfing effect on others, as in the instance of the diminutive *Tormentilla officinalis* and the *Heloscidium nodiflorum*, which passes into the form of *Helosciadium reptans* in such situations.

As we approach the south-western plateaux, and the more or less fissured and cleaved Pentamerus beds near Wentnor, we find the difference in the character of these rocks shown in the *Calluna* giving way to certain characteristic limestone species, and the escarpments, as we proceed in the same direction, supporting *Ranunculus acris*, *Arenaria trinervis*, *Erythræa centaurea*, *Linum catharticum*, and other calcareous species, while the steep and more grassy slopes, southerly, are crowned more or less with dense woodland.

From the measurement made by the Trigonometrical Survey, it appears that the highest point in the Longmynd range is 1,674 feet above the sea level. Such an elevation is accompanied by a corresponding Flora, illustrative of the rule "that a small vertical line corresponds to a large horizontal distance from a main point of solar action."

We have thus the "superior and mid-agrarian zones" of Watson, in a measure, sketched out. The *Pteris aquilina* forms, too, a pretty constant limit at 1,200 feet of the Agrarian region.

Occuping different ranges, the following plants are more or less constant :—*Erica cinerea*, *Viola lutea*, *Veronica hybrida*, *Galium saxatile*, *Vaccinium myrtillus*, and *V. vitis idæus*, *Vaccinium oxycoccos*, *Empetrum nigrum*, *Nardus stricta*, *Molinia cærulea*, *Myosotis collina*, *Centunculus minimus*, *Euphrasia officinalis*, *Fedia carinata*, *Sedum anglicum*, *Jasione montana*, *Teucrium scorodonia*, *Spergularia rubra*, *Tormentilla officinalis*, *Dianthus deltoides*, *Hypericum pulchrum*, *Asperula cynanchica*, *Carlina vulgaris*, *Cnicus acaulis*, *Cotyledon umbilicus*. Of these, as locally ascending, I would specify *Asperula cynanchica* in particular, and the rare *Dianthus deltoides*, which I have met with in one station only, near the Cwms, Spring-bank.

The *Cotyledon umbilicus* seems equally partial to the faces of the dark olive schistose rocks at All Stretton and the porphyritic ledges of Caer Caradoc.

Spergularia rubra is equally locally ascending. The next division, limited to the higher moorland and slopes, comprises *Ulex Europæus*, *Draba verna*, *Viola lutea*, *Veronica hybrida*, *Drosera rotundifolia*, *Arctostaphylos uva ursi* (Stiper stones), *Erica cinerea*, *Empetrum nigrum*, *Vaccinium oxycoccos*, and *V. myrtillus*, *Lycopodium clavatum*, and *L. Selago*, and *Blechnum boreale*.

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This Northern hard fern springs up at every turn when we reach the platform of these grand hills, seeming as much at home among the heather as the "bonny broom," liking equally the boggy ground as we descend to Wentnor and Medlicott, and the arid soil of the conglomerates.

Further Westward the marshy ground at Shelve and Middleton (marking the existence and extension of the longitudinal fault, parallel to the great line of elevation of the Silurian rocks) furnished, in addition to the usual uliginous species, the rare and beautiful *Spiranthes æstivalis*, which I regret to say has vanished from one of its oldest habitats, the Wyre Forest, Worcestershire. At the Light Spout, where the pure and sparkling rills of the Longmynd gorges rush from ledge to ledge down their rocky channels, spreading out in their descent into a series of picturesque sprays, dashed into foaming whiteness, the elegant *Asplenium viride* was gathered by Dr. Campbell, and I trust (for the recurrence of a rare plant is often as certain as its disappearance) may again be secured by some fortunate explorer, who will then have the additional pleasure of associating a specimen with the beautiful scenes in which he has travelled to find it.

As the simplest plants have the widest diffusion, and the relative number of cryptogamous to flowering plants increases from the equator to the Poles, we should naturally expect to find the different tribes of mosses and lichens well represented on these heights. The genera of mosses thus distributed corresponds with those peculiar to the campestral and mountain region of Schimper —the middle and northern zone. Among the most prominent species—and space forbids a more lengthy enumeration—are: *Sphagnum cymbifolium* and *S. Squarrosum*, in the boggy grounds of Shelve, Wentnor, &c.; *Phascum mutieum* and *P. Subulatum*, *Gymnostomum microstomum* and *G. tenue*, *Werssia controversa* and *W. cirrhata*, *Dicranum scoparium* and *D. heteromallum*, *Dicranum squarrosum* and *D. cerviculatum*, *Tortula ambigua*, *T. convoluta*, *T. aloides*, and *Ceratodon purpureus*.

Trichostomum lanuginosum, *Orthotrichum affine*, *Encalypta Vulgaris*, *Schistidium apocarpum*, *Racomitrium heterostichum*, and *R. aciculare*, *Tetraphis pellucida*, *Pogonatum commune*, *Pogonatum nanum*, and *urnigerum*: the social *Polytrichum*, with its roots coiling round each other like a miniature cable, and matting the plants into dense tufts, is a conspicuous feature on these hills.

The Entosthodon, *Funaria hygrometrica*, and the beautiful *Bartrama pomiformis* and *B. fontana*, are frequent in the neighbourhood of the streams.

Fissideus bryoides and *F. laxifolius*, with *Anomodon Viticulosus* on the banks

Trichostomum crispulum, with *Encalypta streptocarpa* (though rare), *Teothecium myosuroides*, *Leskea polycarpa*, and *L. Sincea* are met with on the limestone escarpments.

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The genus *Hypnum* is represented by the species *albicans*, *rutabulum*, *squarrosum*, *velutinum*, *pumilum*, *triquetrum*, *irriguum*, *striatum*, *confertum*, *Swartzii*, *serpens*, *cordifolium*, *palustre*, and *denticulatum*; many of them, however, rarely in fruit yet, spreading equally well by their "proliferous innovation."

Omalia trichomanoides and *Neckera complanata* are of similar occurrence.

Among the *Lichens*, which make a way for bolder foliage, nursed by their decay, we are presented with the northern forms.

Umbilicaria, *Beatora*, *Calicium*, *Cetraria*, *Parmelia*, with its species *badia*, *cinerei conspersa*, *saxatilis*, *physodes*, &c.

Arthonia glaucomaria, *Lecanora tartarea*, *Lecidea*, with *Verrucaria* and the nucleiferous section, *Stereocaulon paschale*, *Beomyces roseus*, &c.

The cosmopolite *Cladonia*, with its species *macilenta* and *pyxidata* is very common here, the species *C. cornucopi-oides*, with its bright red apothecia, being a conspicuous feature and bright ornament, when we are otherwise led to exclaim, in the midst of winter's dreary reign on these heights,—

How dead the vegetable kingdom lies.

On the whole the saxicolous is better represented than the corticolous or terricolous division. The Ericæ, in their social character on these solitary wilds, impress a certain physiognomy peculiar to such a latitude and elevation, yet it may be interesting to remark that aspect and exposure seem to have a correlative effect as regards the distribution of this genus in other localities, for the exposed table land of Hartlebury common, north Worcester, has quite a subalpine aspect, covered with a thick growth of *Erica cinerea* and *tetralix*, and two or three species of Lycopodia; while there is not a solitary Erica or club moss on the Malvern chain or the immediate neighbourhood.

Mr. Symonds told me that he has taken the heath from the Longmynds and planted it on the Beacon, but as yet I have had no opportunity of congratulating him or recording his success.

As regards the Calluna which here marks the moorland zone, its synonym "grig" is, I believe, the only word borrowed by the Salopians from the Welsh. Mr. Hartshorne, in his work "Salopia antiqua," observes, there is no Cambro Silurian patois, proving the English language, as spoken by Salopians in an agricultural district, is marked by extreme accuracy and purity.

Its congener, *Erica cinerea*, is said to have afforded the Picts a delicious wholesome liquor. Leyden thus sings of its praises:—

Though unobtrusive all thy beauties shine,
Yet boast thou rival of the purple vine,
For once thy mantling juice was seen to laugh
In pearly cups which monarch loved to quaff;
And frequent wake the wild inspired lay
On Teviot hills beneath the Pictish sway.

"De gustibus non est disputandum!" The royal anti-tobacconist and pedantic Stuart, in his celebrated "Counterblaste," puts it in the banquet which he proposed for the devil:—

A loin of pork, a poll of ling, and a pipe of tobacco.

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Near the Cwms I have repeatedly found that interesting epiphyte the *Orobanche elatior*, not, however, realising its old Roman name *Herba leonina*. The Ranunculus genus has the species *linqua*, *flammula*, and *aquatilis* here, and furnishes an example of the fact that if the plants of the north temperate regions do not fly to mountain heights for their diffusion, they resort to the equalised temperature of the water; one reason, by the way, why "the Hippuridæ" and other aquatic tribes are so widely diffused from the North of Europe to the South Sea Islands.

Taking the different phases of the species *Ranunculus aquatilis* as I have observed in this neighbourhood, I am induced to regard it as uniting the two varieties *R. circinnatus* and *tripartitus*, fortified as I am in this view by De Candolle, who, with Hooker, thinks the claims of *R. tripartitus* very slender to the rank of a species.

As in many other instances, the word species will be ultimately accepted to mean forms between which transitory links are not found, "as numerous intermediate forms are discovered every year"; and the more these are multiplied, the less able are we to decide what constitutes a variety—what a species.

If we stand upon the latter mental abstraction too firmly, we get landed in the constant difficulty of deciding whether we shall segregate with Babington, or condense like Bentham, and between Scylla and Charybdis, while ignoring the authority of Cuvier, who took a world-wide view, and held that species were not permanent.

There is doubtless a wide diversity in plants as in animals, as regards their respective capacities for variation; that capacity shows itself in the peculiar adaptation which their physical constitution undergoes to circumstances as they change, and in the spontaneous growth of peculiarities not traceable to any such influence.

There are many species, again, which it is most difficult to define on paper; in fact, the attempt at definition shows merely the narrowness of the definer, and reminds us of what Echo said to Ausonius: "If you must needs paint me, paint a voice." The precise answer is a precision of error, an expression of empiricism, and has its opposite in that true philosophy which doubts because it seeks to investigate thoroughly, and rests only and ever on exact and complete observation. The geologist, in prosecuting his search, finds the Longmynds cradling the first faint traces of the dawn of life on our globe. The botanist, too, finds an unmixed indigenous vegetation: borne on their wiry breasts are those plants which, like hardy mountaineers, remain after centuries to fight the battle of life, till removed by the hand of man or the transforming influences of civilisation. Yes, "The tree of life fills with its dead and broken branches the crust of the earth, and covers the surface with ever-branching ramifications."

That stupendous chemistry which has once made seas and continents change places, and hills emerge from ocean's bed, is still preserved in that

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piece of living alchemy, the blade of grass, which weaves its expanding form and crystallises in cells of sunshine, water, carbonic acid, and ammonia;—and that material which was vivified and utilised in those extinct organisms may serve in endless metamorphoses, for we know not what organisms yet to come. What a testimony again to the uniformity and permanence of nature's laws is that living link the *Isoetes*, found in a pool near Darnford; but for the existence of that small water plant the large trees of the coal forests would present in the growth of their stems (that remarkable zone of spherical cells which surrounds their woody cylinder), an unexplained anomaly, but the rays of scientific light extracted from the separate investigations of a Witham and Carruthers here converge in the elucidation of these interesting types.

Placed side by side, the fossil witness, the *Lepidostrobus*, of the coal, and the living *Lycopodia* of these hills, exhibit a close parallel in the size and relative position of their macrospores and microspores. This living link, the *Lycopodium*, carries us still further into the domains of the past, for in the Ledbury shales and Upper Ludlow bone bed, twigs, branches, and spore cases, or *Pacytheca*, give the first real proof of dry land.

We thus derive from such a record that successive geological epochs are in a measure equivalent to the various parallels of latitude marking the zones and climates of the present surface of the earth; for the Coniferæ of the carboniferous age, presenting as they do few of the concentric lines (the marks of annual growth), are exactly met by the same peculiarity of structure in the tropical trees of South America now, and we see how the *Lepidodendron* then, as the *Lycopodium* so abundant on these hills is now, was so well adapted to form part of the flora of that epoch in which vegetable mould was scarce, and when the surface of the globe consisted chiefly of barren rocks and dismal swamps. The more closely we study the numerical laws of plant distribution, the ratio of certain families to the whole number of species, when and where each family reaches its maximum number of species or its highest development, the clearer we find that the replacement of one species by another in space has its exact parallel in past time, so as to preserve a certain ratio of particular families to the whole mass of the Flora, testifying likewise to a certain primitive plan of plant distribution. Further than this, the supposition of specific centres from which diffusion has been effected by emigration and other agencies, appears to be the natural outcome of all investigations in the history of any family of plants.

For as the variations produced by a number or the force of external agents, as already noticed, are strictly coincident with an extended range of any given family, and are such as to induce us to separate the extremes when the intermediate forms are absent; still, if we travel back, in time, guided by the analogy of other organised forms, we lose one after another the more specialised groups, and are able to follow out our converging lines of existence till they meet in the same point, and this remote. So again in the animal world we find various tribes of any species originally, as it would

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appear, placed in certain regions, date more or less from single pairs of species dispersed from primitive centres according to their capacity to endure change of climate, and the absence of physical obstacles to emigration.

In the case of plants, however difficult the task to fix on the true aborigines—whether such was a single individual, a pair, or an indefinite number—yet the very forms which we regard now as typical may be only one of the many variations produced by time and the variable and ever-varying condition of climate. In the next place, we cannot fix the date of such agencies at work; we may, however, reasonably infer that the modifications must depend on the special vitality of each species, and its power to resist and overcome obstacles, and so become cosmopolite in its range. Taking De Candolle's "Prodromus" as our guide, no flowering plant is an absolute cosmopolite.

Under corresponding parallels of latitude, at the same elevation, and with kindred soils, we find distinct genera, and even a genus confined solely to one side of our planet. Such is the *Erica*, confined as it is to the narrow zone extending from the North of Europe to the Cape of Good Hope.

There is no Rose in South America, although the family Rosacis is represented there.

Coming nearer home we have many plants stopping short of our higher altitudes, yet ascending elsewhere to much more boreal habits,—the Juniper and the *Pyrus aucuparia* for example.

In the Grimsel the *Pinus Sylvestris* has been found flourishing up to 6,330 feet above the level of the sea, *Betula alba* to 6,916 feet, and beyond them the *Pinus Cembra* to 7,348 feet, so that here the usual limit of deciduous trees is suspended, and the Birch lies between two belts of Conifers (Humboldt's "Cosmos").

Mr. Darwin, on crossing the Andes of Chili, was struck with the marked differences of the vegetation in the valleys each side, the climate and the soil the same, and the difference of longitude very trifling (Darwin's Travels).

Despite homozoic belts, and isothermal lines, there still remains this enigmatical fact, this inexplicable caprice, unless we concede that the genera in past times have had a much wider range than now, however distinct and exclusive the endermic vegetation of any given district may appear.

The present distribution of sea and land is exceedingly irregular, and what is the geologic record? but, that many other equally abnormal distributions have occurred, and with such, changes of climate, causing the disappearance of certain forms and the occurrence of others in places we do not now expect to find them.

To give one instance only out of many. At the Miocene period, or, more strictly, at its dawn, a temperate clime prevailed within the Arctic circle. Poplars, Planes, and Lime trees grew within twelve degrees of the Pole, and so have beds of the same fossil plants been found in North Greenland, where now an enormous ice cap covers the whole country, leaving only a narrow slip of land free from ice in summer, and where but a few dwarf willows can exist.

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From the very fragmentary character of the geologic record yet brought to light, it is difficult to trace back the entire series of changes, and the reason is this: we have so few land surfaces presented by rock formations that anything like a consecutive record of the Flora that lived in their vicinity cannot be gained.

Those ancient landways, formed by the junction of continents, and marking the commencement of the tertiary period, were undoubtedly so many means of transport by which the different species or genera of those times, spreading out, crept to their proper grounds: and thus a common Flora is an evidence at once that lands now separated were once parts of the same continent. But the very circumstances which favoured an immigration of certain Flora, such as the Iberian, in early tertiary times, were such as to make the northern forms ascend the summits; and this is the reason why we find Alpine species still remaining on our mountain heights, while our southern coasts here and there shelter the extreme northern representatives of species common to the warmer regions of southern Europe.

And during the succeeding pre-glacial, glacial, and post-glacial periods, whether of submergence by the glacial sea or elevation, so many different pathways were opened up for effecting a migration of plants from one continent to the other, and may explain why hardly a single species of flowering plant (I believe *Spiranthes gemmipara* is the sole exception,) is restricted to our island. The great bulk of our Flora, whether on hills, or plains, or sea coasts, is, in similar situations, spread over Europe, the vast area of temperate and North Asia, and follows in the wake of civilisation.

It is well known that the number of species of the Germanic type lessens as we go westward—that while the Flora peculiar to our western counties may be traced down the same departments of France to Spain and Portugal, the eastern counties present certain Scandinavian forms, marking a glacial period.

The shiftings of level evidenced in these formations, involving as they do such changes in the relative proportions of land and water, must have been very influential in favouring the diffusion of some, while opposing obstacles to the spread of other species.

It has been established by the researches of Professor Edmund Forbes that Mollusca, even in their larval state, cease to exist at certain periods of their metamorphosis if they do not meet with favourable circumstances for their development, and the particular zone of depth to which they are adapted; in such circumstances they perish and sink to depths below. For the proofs that our islands formed once a part of a great continent we point to our Mediterranean, Germanic, and Iberian flora.

That ancient tract is now destroyed *sed genus immortale manet.* Each addition to *terra firma* has been stamped by a conquest of Flora, "that ever fresh mosaic" continuous throughout all time.

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Mr. Croll, who attributes the changes of climate marking the different periods of the tertiary epoch to periodical variations in the eccentricity of the earth's elliptical orbit, tells us that for the last 60,000 years eccentricity has been very small. High eccentricity would lead to rapid change of species, low eccentricity to a persistence of the same forms; and as we have been 60,000 years, according to this reckoning, in a period of low eccentricity, the rate of change of species during that time may be no measure of the rate in past geologic ages.

Whatever, or however, these changes have been, there has been a succession of species in time, which has been exactly paralleled by their representatives over wide areas in space. Each life-germ has been a law to itself, taken *ab initio* a certain course, unfolding an end and aim, "each perfect after its kind," but assisted by secondary causes, which in past ages and in the Longmynd flora have been conspicuous by their co-operation.

APPENDIX.

Memorandum of rain-fall at Woolstaston, by the Rev. E. Donald Carr, M.A. (above sea-level about 750 feet):—

	Total Depth.	Number of days on which .01 fell.
1865	31.44	185
1866	35.74	236
1867	32.80	198
1868	33.40	190
1869	33.26	187
	5)168.64	
Average in 5 years	33.728	

Average depth of rain in 1869 for the whole Kingdom, 34.96 inches; the average depth of the five years, 1860-65, having been 35.21, as computed by G. F. Symons in "The British Rainfall of 1869."

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The Woolhope Naturalists' Field Club.

MEETING AT HEREFORD.

THURSDAY, OCTOBER 6, 1870.

THE FORAY AMONG THE FUNGUSES.

"Quos ipsa volentia rura
Sponte tulere sua carpsit."—*Virgil.*
"He culls from woods, and heights, and fields,
Those untaxed boons which Nature yields."

The autumnal meeting of the Woolhope Club is generally spirited and successful. It is the last of the year, and perhaps greater effort is made to attend it—and certainly the well wooded scenery of Herefordshire never looks more beautiful than on a fine autumnal day—but the chief cause of attraction undoubtedly exists in the opportunity it affords for the study of Funguses. This is made the chief object of the day, and no effort is spared to render it as instructive as possible to all who attend. The specimens found are at once named, or if perchance they are new, or present any features of particular interest they are discussed with a scientific zeal that cannot fail to impart itself more or less to all who are present. Thus more real practical progress in the knowledge of this difficult branch of Botany is made in a single field-day with the Woolhope Club than could possibly be gained by any amount of mere closet study.

The long and lovely summer, followed as it has been thus far by a dry and bright autumn, has so completely dried the surface of the ground that vegetation of all kinds languishes for moisture. Notwithstanding the great want of rain, the mists and the dew have occasionally been very heavy, and where the ground is rich and not too hard, have favoured very much the production of Funguses. It is true that they who would gather them in perfection this year must not heed the poet's caution :

"The dews of the morning be careful to shun,
They're the tears of the night for the loss of the sun."

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The members of the Club had certainly not shown much fear in this direction, for the baskets of Funguses they brought with them proved that many a successful foray had previously been made. In addition to these a large hamper had been kindly sent from Whitfield. Holm Lacy and Haywood Forest supplied the vegetable beef-steaks, and Mr. Worthington G. Smith most thoughtfully brought down a selection of the funguses with which he had won the prize the day before at the Royal Horticultural Show at South Kensington.

The great success of the exhibition of Funguses was thus assured, and while several gentlemen most diligently occupied themselves in writing their names and arranging them on the tables provided, the rest, with Elmes Y. Steele, Esq., in the chair, proceeded to transact the ordinary routine business of the meeting.

The following gentlemen were elected unanimously as office-bearers for the year 1871:—

PRESIDENT:

THOMAS CAM, Esq., Hereford.

VICE-PRESIDENTS:

R. J. ISBELL, Esq., Hereford.
EVAN PATESHALL, Esq., Allensmoor Court, Hereford.
The Rev. THOMAS PHILLIPPS, M.A., Dewsall Rectory, Hereford.
The Rev. H. W. PHILLOTT, M.A., Staunton-on-Wye, Hereford.

CENTRAL COMMITTEE OF MANAGEMENT:

T. CURLEY, Esq., C.E., F.G.S., Hereford.
JOHN LLOYD, Esq., Huntington Court, Hereford.
C. G. MARTIN, Esq., Hereford.

HON. SECRETARY:

The Rev. Sir GEORGE H. CORNEWALL, Bart.

TREASURER AND ASSISTANT SECRETARY:

Mr. ARTHUR THOMPSON, St. Nicholas-street, Hereford.

Some other small matters of business were then got over, and at half-past 10 o'clock the carriages were taken for the day's excursion.

The members of the Caradoc Field Club had been invited to join in the day's proceedings and were represented in the field by the Rev. E. Donald Carr, the Honorary Secretary, the Rev. J. D. La Touche, and several other gentlemen. In their honour the special district from which the Club takes its name was to be visited, and the road was first taken for Hagley Park, about four miles east of the city. Here they were kindly welcomed by Arthur Hutchinson, Esq., and proceeded at once to examine the quarry which has so special an interest for the members of the Woolhope Club.

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Minute and careful as were the researches of the officers of the Ordinance Survey in this district, the existance of an upheaval of Silurian rocks at Hagley Park entirely escaped their notice. The discovery of this quarry in which they are so manifestly shown was the first feather in the cap of the Woolhope Club. It was made by the late M. J. Scobie, Esq., who worked at it with all the intelligent zeal for which he was so distinguished. He took the exact dip of the strata, noted their characters, measured their thickness, and collected their fossils, until he had quite satisfied himself with the reality and importance of his discovery. He then invited the late Hugh E. Strickland, Esq., F.R.S., F.G.S., Reader in Geology at Oxford, to come and see it. Mr. Strickland fully confirmed Mr. Scobie's observations, and wrote a paper on the subject which appeared in the Quarterly Journal of the Geological Society.

The general facts and conclusions of this paper were given to the gentlemen present, with an account of the crustacean fossil found here by Mr. Scobie. It proved to be the *Pterygotus problematicus* of Agassiz, and it was afterwards figured and described in the Quarterly Geological Journal by J. W. Salter, Esq., F.G.S.

It was decided that these papers of Messrs. Strickland and Salter should appear in our own Transactions—meanwhile an active examination of the rocks was being made and many fossils were found. The celebrated "Ludlow Bone bed," described by Sir Roderick Murchison in the "Silurian System," is unquestionably represented in this quarry. It occurs between the Downton Sandstone and the Upper Ludlow Shale, and varies here in thickness from that of a wafer to an inch and a half in some places. The quarry was not being worked near the junction at this time, but a search was made specially for it, and with the aid of a man and a pickaxe some few spines were found to-day.

The Rev. J. D. La Touche said this Bone-bed varied very much in thickness in different localities as might be expected. At Corston, Salop, it was as much as six inches in thickness, and consisted almost entirely of a mass of scales and teeth and bones of fishes broken up and water-worn—what these fishes were is not known with any certainty.

Leaving the Quarry the hunt for Funguses beneath the oak trees in the park began most unsuccessfully—not one was to be seen; but here, as everywhere else, the abundance of acorns could not fail to be observed, and the wonder was expressed why they were not systematically collected. When crushed and given in small quantities to sheep and pigs, acorns form a most nourishing and useful food. At a time when fodder is so scarce as it is this year it does indeed seem strange that this prolific source of food should be so much overlooked. The Horse-chestnuts too are still more neglected, and yet it is stated positively that when crushed cows will eat them readily and give an increased supply of excellent milk. This year they too are very abundant and fine, and it is sad that their only use should be as playthings for children to string and hang round their necks. Will no one give village children the

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THE REMARKABLE TREES

OF

HEREFORDSHIRE.

THE HAGLEY PARK ELM.

APRIL, 1371.

This grand tree is growing at Hagley Park, the property of Arthur Hutchinson, Esq. It has a fine upright bole, almost free from the excresences to which Elms are so liable. At five feet from the ground, where the card of the Club is placed (itself one foot by six inches in size), it gives a fair measurement of 22ft. 6in. in circumference. Its top has been broken off at about 30ft. from the ground, but it has sent up a goodly array of secondary branches, which reach to the height of 78ft. The diameter of its foliage spread is 72ft.

This Photograph is kindly presented to the Club by Mr. Hutchinson.

(Ladmore and Son, Photographers to the Woolhope Naturalists' Field Club.)

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delight of collecting them for some small recompense, make experiments with them in feeding cattle and horses, and publish the result? As a scientific society, the Woolhope Club can say they are certainly not poisonous, and equally sure is it that they are nutritious, but whether the animals could really be got to relish them, and if so the best way of inducing them to do so, are points that have yet to be discovered.

Two fine Lombardy Poplars grow in Hagley Park. They are believed to be the largest and tallest in the county. At 5ft. from the ground they measure respectively 12ft. 10in. and 14ft 1in. in circumference. They stand out boldly all alone, and spread out their boughs in a way that conceals their height, and yet the tallest by shadow measurement was made 132 feet high. Each tree sends out from its bole strong buttresses towards the North, the better to resist the winds they are exposed to.

At the foot of one of these trees some fine Funguses were found. They were thought to be *Agaricus (Pholiota) pudicus*, and from their fragrant smell and pleasant taste, which many tried, were also judged to be edible. On reference to the best authorities the surmise proved to be correct.

Some fifty yards from one of the poplars stands the Hagley Park Elm, and this grand tree was next visited. It has still a fine upright bole, almost free from the excrescences to which elms are so liable. It gives in fair measurement, 22ft. 10in. in circumference at 5ft. from the ground. It is long past its prime, has lost its top and many boughs, and is partially hollow, but it is still a noble well balanced tree. It was greatly admired, and the wish was several times expressed that it might be photographed for the Transactions. In the same field another luxuriant elm gives a circumference of 14ft., and thus adds its testimony to the richness and strength of the soil below.

Near the east entrance at the cross road stands an elm which figures as a boundary tree on a map of the estate, with the date 1734 upon it. Its girth is only 11ft. 9in., and it is given simply as a notable tree.

The celebrated trap dyke at Bartestree was the next object on the programme. The fine high pasture field leading to it was searched in vain for the funguses which must commonly grow there; nor did it to-day give the pleasure it usually does to its visitors, for a mist hung over the scene, and rendered but dimly visible Backbury Hill, which had yet to be surmounted, with the well known clump of fir trees on its summit.

The geologists were interested, as they ever must be, with the well known dyke of Greenstone at Bartestree. It has been thrown up in a fissure a few yards wide, through horizontal strata of Old Red Sandstone, and by its intense heat at the time has baked the sandstone into a dark friable mass. It has now nearly all of it been quarried away for road mending purposes. The remainder should certainly be left as an object of the deepest scientific interest.

On leaving this remarkable basaltic dyke, a lofty and most luxuriant bramble bush, hung with sable fruit more than usually fine, attracted attention.

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It was a striking and uncommon variety, but happily the highest authority for this puzzling genus was present, and on being appealed to, Mr. Lees pronounced it to be *Rubus rudis*.

The way was then taken for the high road, and soon a very interesting halt was called in the corner of a barley stubble field, just below the convent. Beneath the drop of a hedgerow oak some funguses were found of a very peculiar character. They were judged at first to be the *Sclerodcrma vulgare*, with its usual centre of dark-blue sporules, opening in a peculiar stellate way in consequence of the dry weather. Mr. Broome, however, at once remarked that the stellate markings were visible on the immature funguses, and he pronounced it to be *Scleroderma geaster* of Fries, which we may call the star-like *Scleroderma*. This variety, though often looked for, has never before been found in Britain, and thus a marked addition to British Fungology has once again been made by the Woolhope Club.

The carriages were again taken at the Longworth entrance lodge for the foot of Backbury Hill. At the Priors Court Farm they were left, and the ascent of the hill commenced through the dense covert which clothes its sides, all beautifully variegated as it was by the touch of autumn. Amongst

"the tints of rich and roseate hues,"

the leaves of the wild Gueldar rose, *Viburnum lantana*, here at home upon limestone, and the almost bloody hue of the Spindle-tree, *Euonymus Europæus*, were eminently conspicuous, contrasted as they were with the pale orange of the Maple, and the varying hues of the fading leaves around them.

Backbury Hill has several botanical productions of interest, among which the Green Hellebore, *Helleborus viridis*, may be noted, while the masses of Virgins-bower, *Clematis vitalba*, flourish with such graceful exuberance as to arrest attention at every step.

The hill is formed by the Aymestrey limestone, which at the summit is broken up into great masses of exposed rock, with such deep cavities and passages interposed between them as to suggest some violent cataclysm having taken place on the spot rather than that slow wearing away by the tooth of time, as was contended for by the Rev. J. D. La Touche. Traces of violence here seemed evident, though whether by the gunpowder of man in blasting the limestone of the quarry or the earthquakes' Titanic effort in ages past, there is no record to show. There is a very interesting Camp on the summit, with a double entrenchment towards the east, and a covered way, but it may not now be dwelt upon.

The exposed precipitous masses of fractured rock are commonly called "Adam's Rocks," but from what circumstance the name is derived, whether legendary or historical, is not known. It may possibly arise simply from the popular idea of their primeval antiquity, or perchance some glorious old chieftain of that ilk held the Camp successfully against all comers; or again, some inglorious rustic Adam may have broken his neck here on a misty November eve, and thus have handed his name down to posterity. Be this as it may, the

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visitor to this spot, whether of a geological or poetical turn of mind (though he must be careful how he turns his body), will be charmed with the prospect before him; the coloured woods, the verdant dales, and boldly rising hills, the distant views stretching on beyond the curvatures of the sparkling Wye to the Black Mountains, bounding the horizon, may not readily be forgotten when once they have been seen. On the present occasion, however, the break of sunshine had unfortunately disappeared, and a tantalising brooding mist,

Like sorrow's veil on beauty's brow,

as Moore writes of a like "Mist o'er blooming bowers," about famed Killarney, now hid the distant prospect, and even dimmed the celebrated Haugh Wood, the dome from which the other rocks of the Woolhope Valley are thrown off subordinately.

The company were here assembled by the sound of the whistle, and having accommodated themselves to the inequalities of the ground, at the request of Dr. Bull the Rev. P. B. Brodie, M.A., F.G.S., gave a very interesting extempore lecture on the geological features of the Woolhope Valley before them, comparing the remarkable features of this district with the more extended one of the Wealden, in Sussex.

In the course of this address Mr. Brodie mentioned that when working in the Woolhope district this spring, with his own Field Club, he had been so fortunate as to discover a small and very perfect specimen of *Eurypterus*, which he had sent for examination to Mr. Henry Woodward, of the British Museum. He had just had a letter from Mr. Woodward, in which he stated that it was a new species, and that he had named it the *Eurypterus Brodiei*, in honour of the finder. It was found at the Perton quarry, near Stoke Edith, and as it came so strictly within the province of the Woolhope Club, Mr. Brodie kindly offered it for illustration in the volume of Transactions, an offer which was very gladly accepted.

The thanks of the meeting having been given to Mr. Brodie, the Rev. F. Merewether, of Woolhope, then read a paper "ON THE DRIFT IN THE NEIGHBOURHOOD OF WOOLHOPE." This paper, which was founded altogether on original observations, will be published at length. The chief facts of the paper were confirmed by Mr. Brodie, and some little discussion arose upon it, in which W. J. Neville, Esq., and the Rev. J. D. La Touche took part.

The order was now given to search for Funguses, but although the district was most favourable for them, beyond the large tufts of the ubiquitous *Ag. melleus* and *Ag. fascicularis* but little was found. Many small specimens of the orange Chantarelle, *Cantharellus aurantiacus*, were gathered; Mr. Houghton found the Fir-cone Hydnum, *Hydnum auriscalpium*, always so curious and interesting; Mr. Elmes Y. Steele got the graceful green agaric with its silky veil and stem, *Ag. æruginosus;* several of the Mycena tribe were also gathered, as *Ag. polygrammus*, *Ag. alcalinus*, with one or two near allies, *Ag. epipterygius* amongst them. These are sufficient to show how many more there would have been under more favourable circumstances. The drought was too prevalent, and

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agarics could only be numbered by units instead of by scores, as fondly hoped for; but, as a popular poet has said,

> "We may roam through this world like a child at a feast,
> Who but sips at a sweet and then flies to the rest;
> And when pleasure begins to grow dull in the east
> We may order our wings and be off to the west."

And so on the present occasion the disappointed Fungologists drew off from the wood to the open ground on the shoulder of the hill, and visited the two stunted hawthorns, so oddly called "The Cow and Calf. The view from this spot is usually most extensive and beautiful, but at this time it was enshrouded in mist, and since the Funguses were again absent, the descent was made to Old Sufton, where the carriages were waiting to convey the visitors to Hereford.

The ride home would have been very pleasant but for the myriads of Aphides which swarmed in the air. It would almost seem true that

> "The thin-winged flies their transient time employ
> Reeling through sunbeams in a dance of joy."

The turnip aphis, however, has been terribly destructive this autumn, and a field on the hill was passed smelling horridly from the decaying bulbs of the turnip plants they had destroyed.

An examination at the Green Dragon of the Funguses brought for Exhibition passed the time remaining before dinner very pleasantly. It was an extremely interesting collection, and the only wonder was that in so dry a season so many could have been produced.

The most striking specimens were the arborescent Funguses, as might have been anticipated. A huge specimen of *Polyporus frondosus* was placed in the centre of the table, and undoubtedly carried off the palm both for interest and novelty. It weighed no less than 14½ lbs., and, from its great size, the beauty of its lines, and its gracefully over-lapping pilei, it proved the chief attraction in the room. This species may be said to be virtually new to Britain, for although its presence has been more than suspected by several botanists, it is not given as British in any of our Floras, not excepting Mr. Cooke's recent Hand-book. It is true that Mr. Berkeley published a species under this name in the English Flora, but he afterwards corrected himself, and referred his former plant to *P. intybaceus*, leaving out *P. frondosus* altogether. A specimen of *P. frondosus*, gathered at Whitfield, was sent by Dr. Bull to the exhibition at South Kensington yesterday, and to-day, besides the grand one brought by J. E. Smith, Esq., from near Hay, there was another from Whitfield, and also a very fine one brought by the Rev. W. Houghton from the Wrekin. We have now, undoubtedly, in England, all the three species of Fries: *Polyporus frondosus*, known, in addition to other characters, by its pore-surface and its flesh turning grey when bruised; *P. intybaceus*, with its hundreds of pilei tufted together, very much branched and smelling like mice; and the *P. giganteus*, with its large imbricated pilei turning red when bruised, and smelling horribly like rotten cheese.

There were also very fine specimens of *Polyporus applanatus*, and *P.*

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hispidus with *P. rufescens*, *P. fumosus*, *P. varius*, *P. annosus*, and the ever-present *P. squammosus*.

The *Polyporus hispidus* is very handsome, but withal uncouth-looking, covered with rough, dark hair—handsome in its bold ugliness. It is fleshy, and abounds in juice, and one gentleman present, greatly to the amazement of the others, declared that he had been eating it in mistake for the "Vegetable Beefsteak," and it was not bad, though he did not care to try it again.

The next Fungus which created most interest was a fine specimen of the edible *Sparassis crispa*, brought by the Rev. W. Houghton from Chetwynd Firs. It was the size of a cauliflower, of a bright orange colour, and had a very pleasant, fragrant odour. It is very rare, but has been found this year in other localities, as attested by the Rev. M. J. Berkeley and C. A. Broome, Esq.

Two fine sturdy specimens of *Ag. corticatus* were exhibited. They were found growing on a beech tree, and possessed considerable interest, as well for their great beauty as for the great rarity of their occurrence in this country *Agaricus porrigens*, a beautiful snowy white Plurotus of great rarity and beauty, peculiar to fallen pines, was sent from the Duke of Argyll's plantations at Inverary: The rare *Cortinarius fulgens* was there also. The Lactarii, *deliciosus*, *rufus*, *torminosus*, *vellereus*, with its variety *exsuccus* and *controversus*. The Russulæ, *rubra*, *fragilis*, *lepida*, and *alutacea*. The Boleti *luridus*, *edulis*, and *versipellis*. The Agaricini, *Cecilicæ*, *proctrus*, *rubescens*, *maculatus*, *rutilans*, *squarrosus*, *rimosus*, *nudus*, *tuberosus*, *gallinaceus*, *butyraceus*, *lacrymabundus*, *infundibuliformis*, &c., &c. *Fistulina hepatica*, *Paxillus involutus*, *Hydnum udum*, *H. repandum*, *Gomphidius viscidus*, *Helotium vergultorium*, *Marasmius androsaceus*, &c.

A very puzzling lot of sulphur-coloured Agarics was brought by Mr. Houghton, which seemed to agree with no known group. They were, however, provisionally referred to the rare *Ag. (Flammula) inopus*, of Bolton, or perhaps *Ag. hybridus* of Fries.

A great variety of common Agarics, which it is unnecessry to mention, were conspicuous by their absence.

There was some little difficulty in procuring sufficient edible funguses for the dinner, but the following dishes were sent round with more or less satisfaction:—*Fistulina hepatica* fried, and finding its own gravy; *Ag. deliciosus* stewed; *Ag. procerus* and *Ag. rubescens* broiled. The novelty of such dishes is now over with the Woolhope Club, and it becomes difficult to take the opinion upon them. Procerus was most asked for again, and may be supposed, therefore, to take the place of honour.

After dinner the President called upon Edwin Lees, Esq., F.L.S., &c., to read his paper "ON SOME CURIOUS ALGÆ, ONLY APPARENT IN TIMES OF DROUGHT, WITH NOTICES OF THOSE THAT OCCUR AND COLOUR WATER AT SEASONS OF HIGH TEMPERATURE," and Dr. Trimen of the British Museum, made some remarks upon it.

An autograph letter from Professor Fries, of Upsala, to Worthington G. Smith, was then read by Dr. Bull. It was a critical review of the "CLAVIS

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AGARICINORUM," published in the last volume of the Woolhope Transactions, and gives Fries' own views respecting the modification of the arrangement of the Agaricini, as proposed in the Clavis.

The following papers were also read:—"THE FUNGI WHICH AFFECT OUR FOREST TREES," by Worthington G. Smith, Esq., F.L.S.; "NOTES ON FAIRY RINGS," by Jas. Buckman, Esq., F.L.S., &c.; and "ILLUSTRATIONS ON THE EDIBLE FUNGUSES OF HEREFORDSHIRE," by Dr. Bull. These papers, with such discussion as they elicited, will be published in full, and it only remains now for us to say that they were of high interest, and gave much entertainment to the members present.

The following list gives the names of those who took part in the day's proceedings:—President, Elmes Y. Steele, Esq., Abergavenny; Vice-Presidents, the Rev. W. C. Fowle, M.A., Brinsop, the Rev. Arthur Gray, M.A., Oroop, and James Rankin, Esq., M.A., Bryngwyn; C. E. Broome, Esq., M.A. F.L.S., Bath; the Rev. J. D. La Touche, M.A., Stokesay, Salop; the Rev. E. Donald Carr, M.A., honorary secretary to the Caradoc Field Club; Edwin Lees, Esq., F.L.S., F.G.S., &c., Vice-President of the Worcester and Malvern Naturalists Field Clubs; the Rev. P. B. Brodie, M.A., F.G.S., &c., Vice-President of the Warwickshire Field Club; Henry Trimen, Esq., M.B., F.L.S. of the British Museum; Wm. James Neville, Esq., F.G.S., F.L.S., &c., London; the Rev. William Houghton, M.A., F.L.S., Preston, near Wellington, Salop; Worthington G. Smith, Esq., F.L.S., London; Edward S. Hutchinson, Esq., High Sheriff, Longworth; Arthur Hutchinson, Esq., Hagley Park; the Rev. James Davies, and Mr. J. H. Davies, Moorcourt; Arthur Armitage, Esq., Moraston; Wm. Horton, Esq., Stanway Manor, Salop; the Rev. Holland Sandford, M.A., Eaton Rectory, Salop; Dr. Bull, Hereford; Wm. Phillips, Esq., Shrewsbury; the Rev. H. W. Phillott, M.A., Staunton-on-Wye; Thomas Cam, Esq., Hereford; the Rev. C. J. Robinson, M.A.; T. Curley, Esq., F.G.S., Hereford; the Rev. R. H. Williams, Byford; the Rev. F. Merewether, Woolhope; John C. Kent, Esq., Worcester; the Rev, A. H. Price, Lugwardine; John Lloyd, Esq., Huntington; Dr. T. Algernon Chapman, Hereford; the Rev. H. J. W. Stillingfleet, Mrs. Stillingfleet, and Miss C. Stillingfleet, Mrs. and Miss Biddulph, Miss Amphlett, Henry Hathway, Esq., and Lieut. Saunders, Hampton Bishop; J. G. Morris, Esq., Hereford; the Rev. John Wood, Bishopstone; Wm. Hooker, Esq., and Francis Lyell, Esq., Stokesay, Salop; J. H. Wood, Esq., M.B., Tarrington; J. E. Smith, Esq., Hay; the Rev. A. E. Evans, Holmer; the Rev. A. H. Jones, Shecknill; D. R. Harrison, Esq., Holmer; H. Trafford, Esq., Preston, Salop; the Rev. G. H. Clay and the Rev. E. K. Clay, Kington; Henry Newman, Esq., Leominster; Chas. Plowright, Esq., Lynn, Norfolk; Alfred Purchas, Esq., Ross; the Rev. J. H. Jukes, Hereford; Henry Thompson, Esq., Baltimore; Mr. F. G. Harman, The Vallets; Mr. J. E. Alexander, Leominster; and Mr. Arthur Thompson, Hereford.

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THE SILURIAN ROCKS OF HAGLEY PARK.

BY THE LATE HUGH STRICKLAND, ESQ., F.R.S., F.G.S.

The little village of Hagley, a hamlet of the parish of Lugwardine, is situated on the flat summit of a hill which falls away from it in every direction. The high road from Hereford to Ledbury passes over the hill in its longest axis, and the distance from the valley of the river Lug to that of the Froome is about a mile and a half. This hill has been termed the "The Hagley Dome." It is formed by an upcast of Silurian rocks, the existence of which had escaped the careful researches of the officers of the Geological survey of Great Britain. The discovery of the nature of its formation is due to the late M. J. Scobie, Esq., of Hereford, the first honoray secretary of the Woolhope Club. A quarry had been opened in Hagley Park, two or three hundred yards west of the house, and in this quarry Mr. Scobie detected the junction beds of the Old Red Sandstone and of the Upper Ludlow Rock. He invited the late Mr. Strickland to come and examine the quarry. Mr. Strickland was extremely interested by the discovery, and with the aid of Mr. Scobie and his fossils, he drew up the following account for the Journal of the Geological Society.

The area of Silurian Rocks here exposed on the surface consists of yellowish sandstones referable to the "Downton Sandstones" of Sir Roderick Murchison. It rests on grey micaceous schists, and dips on all sides beneath the sandstones and marls of the Old Red series. These rocks seem to form a portion of a very flattened dome, and the quarry which extends about seventy yards from N.W. to S.E., cuts through this dome on its south-western slope. Such, at least, is the conclusion drawn from the dip of the beds, which at the north end of the quarry is about 10° N.W. by W.; at the middle of the quarry, 5° W.N.W.; about twenty yards further south, 8° W.S.W.; and at the southern extremity 7° S.S.W.

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The following section is here exposed in descending order, as far as the irregularities of the stratification permit them to be measured :—

		Ft.	in.
Old Red Sandstone	1. Red marls and clays containing bands of whitish sandstone not calcareous	12	0
Downton Sandstones	2. Hard brownish sandstone	2	0
	3. Flaggy slightly micaceous brown sandstone ...	2	0
	4. Highly micaceous, thin-bedded brown sandstone	2	0
	5. Band of clay and rubble, about	0	6
	6. Micaceous yellow sandstone, with traces of carbonised plants	2	0
	7. Clay and rubble	0	6
	8. Micaceous yellow sandstone, with numerous fragments of carbonised plants	4	0
	9. Bones, teeth, and scales of fish, about ...	0	1
	10. Gray micaceous shale, effervescing with acid, and full of fossils, about	4	0
	Total	29	1

The vegetable remains in the beds Nos. 6 and 8 are interesting from their extreme antiquity, but in general they present no traces of their organic structure. They are merely rounded, water-worn fragments converted into a coaly mass, which cracks in drying. When ignited, these fragments burn like anthracite, without smoke or flame, and remain ignited until they are reduced to a light white ash. The occurrence of vegetable remains in the corresponding beds at Downton Castle is noticed by Sir R. Murchison (Silurian Sys., p. 197), and near Stoke Edith and in the May Hill district by Professor Phillips (Geol. Survey, vol. 2, p. 176, 188, and 312).

The bed No. 9 is interesting as being unquestionably the representative of the "Ludlow Bone Bed," described by Sir R. Murchison (Sil. Syst. p. 198). His description of this deposit near Ludlow, as "a mass of scales, ichthyodorulites, jaws, teeth, and coprolites of fishes, united by a gingerbread cement," is precisely applicable to the stratum at Hagley. The cement which unites the bones is calcareous and imperfectly crystalline, exhibiting a *chatoyant* lustre when the eye catches the light reflected from the cleavage-planes. This singular deposit of ichthyic remains seems as a thin band, in some places no thicker than a wafer, and gradually increasing at other parts to about an inch and a half in thickness, as if deposited by eddies in shallow depressions of the sea bottom. The conditions are precisely similar to this well-known bone bed at the base of the Lias formation. These minute osseous fragments are mostly much waterworn and highly polished by mutual friction. Some of them are black, but the majority are of a yellowish or ferruginous tint. As very few of the bones or teeth are

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sufficiently perfect to indicate genuine or specific characters, we are only able to enumerate the following :—

Species of *Onchus Murchisoni*, Agass. Sil. Syst. pl. 4, f. 10.

Teeth of *Thelodus parvidens*, Agass. Sil. Syst. pl. 4, f. 34—36.

Teeth resembling those figured in Sil. Syst. pl. 4, f. 37, but serrated at the margin.

Ganoid scales.

The only molluscous remains in the fish-bed are the *Orbicula rugata*, Sil. Syst. pl. 5, fig. 11, and an *Orthis*.

In some places fragments of coaly matter similar to that in bed No. 8, are mixed up with those osseous remains. One of these carbonaceous pellets seems to be the seed of some terrestial plant. It is globular, about a quarter of an inch in diameter, and being broken across exhibits a central cavity, the parieties of which are about one-tenth of an inch thick, and composed of fibres radiating to the external surface.

The bed No. 10 corresponds in character with the uppermost strata of the Ludlow Rocks, wherever they are visible in the neighbourhood. It is a fine grained sandy shale of a greenish or greyish colour, abounding with small particles of Mica, and effervesces with acids, although not sufficiently calcareous to deserve the name of a limestone.

The following organic remains occur in it at the Hagley Park quarry :—

Favosites polymorpha, Goldf., Sil. Syst. pl. 15, f. 2.

Cophinus dubius, König., Sil. Syst. pl. 26, f. 12.

Cyathophyllum, E.

Crinoidal stems, pentagonal.

Cyathocrinites macrostylum, Phillips's Manual Geol. Survey, ii., p. 384.

Serpulites longissimus, Murch, Sil. Syst. pl. 5, f. 1.

Homalonotus Knightii, König., Sil. Syst. pl. 7, f. 1—2.

Calymene Blumenbachii, Bronga, Sil. Syst. pl. 7, f. 5.

Rhynchonella semisulcata, Dalm (under the name of *Terebratula lacunosa*, Sil. Syst. pl. 5, f. 19).

R. Wilsoni, and *R. nucula*, Sow. Sil. Syst. pl. 6, f. 7 ; and pl. 5, f. 20.

Orthis orbicularis, and *O. lunata*, Sow. Sil. Syst. pl. 5, f. 15—16.

Strophomena filosa, Sow. Sil. Syst. pl. 13, f. 12.

Leptæna sarciculata, Schlott *(L. lata)* Sil. Syst. pl. 5, f. 13.

Orbicula striata, and *O. rugata*, Sow. Sil. Syst. pl. 5, f. 11—12.

Lingula minima, Sow. Sil. Syst. pl. 5, f. 23.

Orthonota amygdalina, and *O. retusa*, Sow. Sil. Syst. pl. 5, f. 2 and 5.

Avicula ampliata, Phillips, Man. Geol. Survey, ii., pl. 3, f. 1.

Orthoceras bullatum, and *O. ibex*, Sow. Sil. Syst. pl. 5, f. 29—30.

O. perelegans, Salter, Man. Geol. Survey, ii., pl. 13, f. 2 ; and

O. gregarium, Sow. Sil. Syst. pl. 8, f. 16.

Many of these fossils, especially the *Orthocerata*, are penetrated with sulphuret of iron, which gives them a bright metallic gloss.

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In addition to the above mentioned invertebrate forms, an interesting portion of a crustacean was found by Mr. M. J. Scobie in the Upper Ludlow shale, underlying the bone bed, of which the description by Mr. Salter is given below.

Traces of ichthyic remains, especially the minute teeth of *Thelodus parvidens*, are occasionally found interspersed in the bed No. 10, but never in the same abundance as in No. 9.

Having thus enumerated the strata of the Hagley Park quarry, and their organic contents, a few remarks must be made on the geological phenomena attending them.

It has been stated above that the beds here exposed assumed the form of a flattened dome. This protruded dome is about half a mile to the west of the well known dyke of Greenstone, at Bartestree, which cuts through horizontal strata of Old Red Sandstone, and runs in an E. N. E. direction towards the southern edge of the protruded Silurian mass of Shucknall Hill (Murchison, Sil. Syst., p. 185). About a mile and a-half further to the S. E. we come to the elevated region of Woolhope, the axis of which runs for more than ten miles still in a S. E. direction. It appears, therefore, that the ejection of the trap-dyke at Bartestree, together with this protrusion of Silurian rocks at Hagley Park, occur exactly on the axial line of the great elevation of Woolhope.

But though this coincidence of position deserves notice, yet the forces which have caused these minor protrusions have, in fact, acted nearly at right angles to the direction indicated. The Woolhope region, though possessing an axis from N.W. to S.E., is essentially an *area* and not a *line* of elevation. Its pressures have been distributed, not in two opposite directions from an axis, but in every direction from a centre. In conformity with this view we find that in its north-western portion it is cut through by the "great Mordiford fault," running N.E. by E., or nearly at right angles to the major axis, and causing the strata about Dormington and Stoke Edith to assume the same strike.

Beyond the Woolhope area we find the valley of the river Froome, the Bartestree Dyke, and the protruded Silurian mass of Shucknell Hill, assuming the same east, north-easterly direction. And in the small, dome-like protrusion of Hagley Park, which lies parallel to Bartestree Dyke, and precisely in the axis of Shucknall Hill, we find a further proof of the same movement.

It appears probable, then, that the pressure caused by the elevation of the central dome of the Woolhope area, acting in every direction, has on the north-west side caused great undulations in the Silurian and Devonian strata, which lie beyond the region of actual elevation. In two instances, those of Hagley Park, and Shucknell Hill, the denudation of the Old Red Sandstone has exposed to view the subjacent Silurian rocks on the summits of these undulations. Great shattering and dislocation would of course accompany these movements, and in the Bartestree Dyke it is interesting to find one of the great crevices thus formed, and filled with eruption matter derived from the Plutonic region where all these great movements originated.

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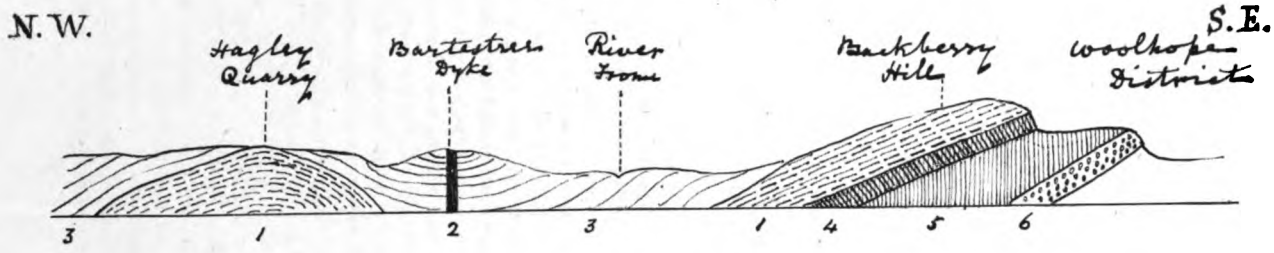
Section from Hagley Park to the Woolhope District.



1. 1. Upper Ludlow Rocks.
2. Trap dyke forced up through
3. 3. Old Red Sandstone.
4. Aymestrey Limestone.
5. Lower Ludlow Rocks.
6. Wenlock Limestone.

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DESCRIPTION OF THE PTERIGOTUS PROBLEMATICUS, AGASS.

By J. W. Salter, Esq., F.G.S.

The limbs of this interesting fossil not having been hitherto discovered, the specimen found by Mr. Scobie at the Hagley Park quarry is of considerable interest as connecting it satisfactorily with the species so fully figured by Agassiz, which was obtained from the basement beds of the Old Red Sandstone of Forfarshire. But though of the same genus with the Scotch fossil, it presents characters which separate it specifically.

As there are on the same slab with it numerous specimens of *Avicula retroflexa*, *Orthis lunata*, and *Orbicula rugata*, there can be no doubt of its being in the Upper Ludlow rock; and we are therefore justified in considering it as belonging to the species which is so common (though always in a fragmentary state) in the same stratum throughout Shropshire, Herefordshire, and the Malvern Hills; a fragment of the carapace of which is figured by Agassiz (Sil. Syst. pl. 4, f. 4 and 5).

Of the two fragments on the slab the best preserved is that of a finger, probably the fixed one. It is two and a half inches long, and seven and a half lines broad, exclusive of the spines, and of equal breadth throughout; but it neither shews the base nor the tip, and must have been considerably longer. The substance is very thin, sections of the broken ends showing this condition very plainly.

The spines along the inner edge are long, conical, or almost cylindrical, and are set fully their own breadth apart; they are of various sizes, several small ones being interposed between the larger spines. There are seventeen of the smaller spines on the fragment, each about a line high; there are two larger ones about a quarter of an inch in length, and one larger spine towards the middle, which is broken, but its bone is a quarter of an inch broad. All the spines turn a little backward, as in *Pterygotus Anglicus*, and are finely striated lengthwise, rather obliquely. The surface of the finger itself is very ill-preserved and crushed. It appears not to have been quite smooth, and there are scattered small tubercles towards the inner edge, as well as minute prickles interspersed between the spines.

In *P. Anglicus*, as figured by Agassiz, the spines are much larger and more coarsely striate, and they stand so close together that their bases often touch; they are, too, fewer in number than in our fossil, and the finger is shorter than this appears to have been.

The other fragment is more doubtful; it has spines along the margin like the last, but they are much larger and more closely placed, so that their bases approach each other. There are also small prickles interspersed as in the last; but the margin on which they are set, instead of being slightly concave, is considerably convex, and unless it has been much curved by pressure, could hardly have belonged to the extremity of the limb. On this fragment, but probably not connected with it, there is a large conical spine or articulation constricted at its base. It is an inch long by five lines broad,

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and has one of its edges closely serrated. It is of the same thin substance as the other fragments, and is striated longitudinally like the other spines, the striæ radiating upwards from its base. It is perhaps the terminal joint of one of the feet, or, if articulated with the fragment to which it is attached, it might indicate one of the lateral appendages such as are found in the abdomen of *Simulus*, and the convex spiny border might then well be part of the abdomen itself. This is probably the right explanation.

In the collection of the Geological Survey there are fragments of the limbs of this crustacean found in the Tilestones at the base of the Old Red Sandstone at Kington. Two or three joints, each about an inch long, and the broadest more than half an inch in width, are found together; they are compressed towards their inner edges, and thickened on the back or outer edge, which is also marked by several of the semicircular folds so characteristic of the entire crust. With these is associated a large fragment like the tail-flap of a lobster, but much more probably the base of one of the thoracic feet. It is very thick on one side, and towards its outer margin is covered by closely set tubercles, which become small spines on the edge itself. The thick portion is smooth externally, or has only a few of the characteristic folds; and the outer edge shows no trace of the large crowded spines or appendages so conspicuous in this portion of the *Pterygotus Anglicus*.

Naturalists seem to be agreed that the *Pterygotus* was a gigantic Entomostracan, and Agassiz published it as such. It differed from *Limulus* in having the segments of the abdomen freely articulating with each other. In this respect it agrees with *Eurypterus*, a genus of equally gigantic crustaceans, which Professor McCoy happily arranges in the *Pœcilopoda*. He examined perfect Scotch specimens of *Pterygotus*, and found the eye-like pits on the shield very like those of *Eurypterus*, but they are as large as the orbits of a horse's eye.

It is probable that there are numerous species of this genus yet to be found in the old rocks.

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Fossil Sketches № 8

PTERYGOTUS PROBLEMATICUS. *Agassiz.*

From the Upper Ludlow Rock in the Quarry at Hagley Park, Herefordshire

Fig. 1. Part of the claw of *Pterygotus Problematicus.* It is probably the fixed finger, and shows the striated spines of unequal size.

Fig. 2. A portion of, probably, the spinous edge of the abdomen, with one of the lateral appendages attached.

Fig. 3. The large spine or appendage, magnified to show more clearly the radiating striæ and lateral teeth. This spine may possibly be a terminal joint of one of the feet pressed against the fragment, but not articulated with it.

Fig. 4. Some of the smaller spines magnified.

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ON THE DRIFT IN THE NEIGHBOURHOOD OF WOOLHOPE.

BY THE REV. F. MEREWETHER, B.C.L.

From my residence at Woolhope I have been enabled to bestow more time and attention to the formations and disturbances of this neighbourhood than others, who come here for a day, or perhaps only a few hours.

It is, however, chiefly with regard to the subject of *Drift*, that I now wish to call the attention of the members of the Woolhope Club; particularly as I have not been able to discover in any account of the Geology of this neighbourhood the slightest allusion to those Drifts which I will now endeavour to describe.

In the first place, then, a section of debris, washed down from higher ground, is visible in a meadow on the right hand side of the road leading from the village at Woolhope towards Ledbury, where on the sides of a prill of water running in a direct line towards Sollars Hope, may be seen, between the road and a bridge having a footpath over it, a considerable quantity of Drift, which has filled up the low ground to a level surface. In this particular place, the Drift as far as at present can be determined, is only from one to two feet in thickness, but it is still visible on the sides of an open drain for at least 100 yards above it, and for the same distance below, as well as on the eastern side at about 80 yards from this watercourse (which is entirely artificial, and was originally made to carry off the superfluous water from the moat which surrounded the old Court House;) while from the uniformly level appearance of the meadow and adjoining land it is not unreasonable to assume that it extends over several acres. The Drift itself is composed for the most part of small rounded pieces of Wenlock limestone imbedded in white earthy matter.

From it I have obtained the following specimens of Wenlock limestone fossils, generally too much rolled to be determined, none specifically, and only a few indeed generically; viz., Corals, *Heliolites; Omphyma. Orthoceras* fragment, small *Bellerophon*, *Rhynconella*, *Atrypa reticularis*, &c. It will be observed that not the slightest fragment of Llandovery Sandstone is to be found in this Drift.

But it is on the S.W. side of this valley of elevation that the greatest amount of Drift is observable.

In the village of Fownhope, nearly opposite the Green Man inn, a section of about two feet in thickness, though, in all probability, it greatly exceeds this, may be seen by the road-side, over a foot-path leading to the bridge opposite the

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Post-office. From this I obtained a very good specimen of *Calymene Blumenbachii*; and here are fragments of Llandovery sandstone, as well as of the Wenlock and Ludlow rocks, imbedded in a similar matrix to that at Woolhope.

A few yards beyond the Old Mill, there is a section of Drift from 20 to 30 feet in height, containing rolled and water-worn Silurian Fossils mostly from the Wenlock limestone, of which there are numerous pieces, varying in size and shape throughout the mass, containing *Rhynconellæ*, *Leptænæ*, *Bellerophon*, and part of an *Orthoceras*, all more or less worn, and therefore undeterminable specifically.

The abraded condition of these fossils in the Drift here and elsewhere in the district, seems to indicate a violent aqueous action within the area described, for it is evident that the fossils it contains were, for the most part, of local origin, and not brought from any great distance. At the base of this Drift may be seen large tabular blocks of the Ludlow and Wenlock Limestone intermingled with smaller fragments. Above this is a somewhat remarkable bed of red sand from one to two feet in thickness without the intermixture of any other material. And above this again, the Drift is mainly composed of smaller fragments of Silurian rocks with the occurrence of larger ones occasionally.

This accumulation of Drift extends nearly all the way to the hill under Westwood, beyond the new bridge leading to Holme Lacey. After passing Serpent's Lane, which is at the end of Westwood, begins the Mordiford Drift, which is a continuation of that at Fownhope, interrupted by the high ground under Westwood. This Drift is well known, and has been already described in your proceedings, and is the only one in this district which has been hitherto referred to. There is a great similarity in the two Drifts, though the one above described is considerably the largest. It is impossible to form any opinion as to how far it may have extended from the Ludlow rocks, which form the boundary on this side of the upheaved strata. The section which is now exposed to view is from 100 to 200 yards from them, and of a thickness of from 20 to 30 feet. Assuming that *that* was its greatest thickness at, say even 100 yards from the Ludlow rocks, how far beyond its present position it may have extended, or how much thicker it may be, must be left entirely to conjecture. At present the river Wye runs within a few yards of the section near the timber yard, which it washes in floods, and has scarped. But there was a period, and I think I am borne out in my conjecture by the present appearance of its *shores*. if I may be allowed to use that term, when either the river Wye ran immediately beneath the road from Mordiford to Fownhope (a considerable length of which is formed over Drift), or else, which I am inclined to think most probable, the whole tract of level land extending from Hereford above Lugg Bridge and as far as Weston Beggard, was one large lake, fed by the rivers Wye, Lugg, and Froome—the head or termination of which was at Capley.

If any one will examine the banks of the Lugg anywhere about Hampton, he will see that the soil through which it runs is entirely alluvial; and

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the same may be applied to the Wye. There are evident marks of the soil having been water-worn, all the way at intervals, on the left bank of the assumed lake, from under Sir Herbert Croft's house at Lugwardine above, and at Tidnor Forge—for at least half a mile upon the bank under Sufton Court to the orchard belonging to the vicarage at Mordiford—from the bark yard to the new bridge—particularly from two cottages on the right hand side of the road about 100 yards beyond the 5th milestone from Hereford, to the timber yard before mentioned—to and beyond Fownhope—to the Lea brink (What does this name imply?) from hence there are evident marks of a water-worn shore all the way to Capley. On the right bank of the present valley of the Wye there are equally unmistakable appearances, viz., under the Bower Wood, the Red Bank, the Folly farm, Holme Lacey Park, Hollington, upper part of Handcock's Stream, under Ballingham Wood, and thence to Capley.

In my opinion the *level* part of the land, known as Lugg meadows, can only be attributed to the subsidence of mud held in solution in water, which water was *not running*, but *still*; I do not think a succession of floods would have left so perfect a level. Near to Hampton there is a large bank containing many acres, composed of gravel, water-worn pebbles, and boulders, lying midway between the streams formed by the Wye and Lugg, and just in the position where the set of the currents would have formed a bank.

If this lake theory is inadmissible, the river Wye must at some period or other have taken its course over the whole tract of land now lying between the Mordiford and Fownhope road and Holme Lacy; in either case it is not difficult to account for the proportionably small quantity of drift now visible; the greater and unknown quantity having been washed away.

To those who are acquainted with the bearings of this valley of elevation, it is known that from the S.E. extremity of Marcle Hill to Mordiford there is a continuation of high ground, and no break through which the sea which covered this district at the time of its upheaval could have carried off the upraised water; but on the S. to the W. sides there are many such; and wherever a break or fracture occurs on the outside range of hills, opposite to it may invariably be found the debris brought from higher ground by the waters rushing through it to seek a lower level.

I take this opportunity of stating that I have ascertained beyond all doubt that the Llandovery Sandstone at the Foulmires farm in this parish, to which I directed the attention of some of the visitors of the Woolhope Club on the 25th of August, 1868, as recorded in the Transactions of that day, is *in situ*, though contrary to the opinion of a late eminent geologist (T. W. Salter, Esq., F.G.S.), who thought it a transported mass of rock. I am able to speak positively as to this, having caused the soil to be removed until the surface of the Ludlow Sandstone appeared, presenting an unmoved and level surface, having the usual character of this formation. There is also an outcrop of the same formation, though hitherto, I believe, unnoticed, on the right-hand side of the new road leading from this place to Fownhope, at the base of a wooded

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hill called the Rudge Wood, about 40 yards from a gate leading into that wood (applause).

The Rev. P. B. BRODIE said that he considered the facts brought forward in his friend Mr. Merewether's paper of special interest, as they were new and unexpected, and formed an important addition to the Geology of the Woolhope area. The first point referred to was the existence of a much larger amount of Drift than had been previously recognised, only a very small mass having been hitherto recorded, and it had always been a matter of astonishment to the geologists who knew the district that so little should have been preserved. I had the pleasure of examining the several new localities with Mr. Merewether where the Drift has been detected, and I am happy to be able to confirm his statements. In one place on the banks of the Wye referred to in the paper it was at least 40 or 50 feet thick, and future researches will no doubt give a more extended range, and perhaps a greater vertical thickness, to the deposit in the district. Of course an enormous mass of the Silurian Rocks there have been entirely removed, without leaving any trace of their presence there. The amount of denudation must therefore have been very great, in which no doubt water in conjunction with atmospheric causes, and perhaps ice, bore a conspicuous part. Anyone who has carefully examined the Drift and is well acquainted with the geology of Woolhope must be satisfied that mere subaerial denudations (as my friend the Rev. J. De La Touche contends) could not have broken up the rocks, eroded the valleys, and carried away entirely a vast amount of detritus, leaving only a limited (however large) quantity of Drift as the result. The second point for consideration was the presence of the May Hill (Llandovery) Sandstone at several localities in the Woolhope area. This is a fact hitherto unsuspected, and one of which had even been doubted by my friend the late Mr. Salter. Having inspected the spots indicated, I must say that my impression is, that the discovery is correct. At Foulmire's farm, the disputed locality, an excavation proved the occurrence of this sandstone in the usual form of large tabular masses *in situ*, and I believe in its normal position not upheaved beneath the Wenlock limestone. It lies nearly horizontally in a denuded valley bounded by a ridge of Wenlock limestone on the south-east adjacent, and the Woolhope (or lower Wenlock) limestone forming the high ground at Woolhope, near the church, about half a mile on the north-west. The lower ground intervening is covered by Drift. Now I think it is generally allowed by geologists who have studied the palæozoic rocks, and know the places here referred to, that the May Hill Sandstones are not confined to the more central anticlinal dome of Haugh Wood, but extend beneath the whole area more or less, notably to the north-west and south-east, the latter point being in the direction of May Hill, where they again re-appear, and form the high and remarkable rounded elevation similar to Haugh Wood. They also occur at Eastnor Park, Howler's Heath, and other places at Malvern on the north-east. Their presence, therefore, at

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Foulmire's farm is not at all surprising, and had a deeper excavation been made when Mr. Salter visited it, I feel sure that he would not have expressed any doubt about it. As a mere question of physical geology, it appears to me that we should fairly expect to find the Sandstone at many points where in the lower valleys the overlying rocks had been removed, leaving the earlier formation in its original position, and openings in the lower ground might in all probability detect it.

I wish to take this opportunity of stating that there is a considerable mass of Aymestrey limestone seen in a newly opened and much disturbed quarry on a hill near Sollars Hope, where I think it has not been before observed. As this limestone only appears at a few places in the neighbourhood, it is desirable to note it wherever it can be traced. Though so rich in fossils at Aymestrey and elsewhere it is here nearly unfossiliferous.

The Rev. J. D. La Touche took exception to the supposition of the occurrence of any sudden enormous force in the production of the arrangement of rocks before them, and thought that the agencies now in action were sufficient to produce the results by gradual denudation, if only time enough were allowed for the purpose, as shown by Sir C. Lyell is his able work.

Wm. James Neville, F.G.S., London, also called in question the assumed fact that lake deposits were necessarily level. The sediment from streams was flat, but that from lakes was irregular. A general conversation now brought the discussion to a close.

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MR. WORTHINGTON G. SMITH'S "CLAVIS AGARICINORUM."

BY DR. BULL.

The verdict of Science on the "Clavis Agaricinorum" cannot fail to be a matter of great interest to the members of the Woolhope Club. Mr. Smith's valuable addition to the resources of the student in this branch of Mycology was introduced to the public for the first time at our annual meeting in February last. How far the appreciation it met with here has been reciprocated by some of our foremost Mycologists has now to be seen :—

1. The *Journal of Botany* at once inserted the "Clavis" at length, with its illustrations, into its pages, but omitted the full list of British Agarics.

2. A complete copy was sent to Elias Fries, of Upsala, and the illustrious Swedish professor—whose renown is world-wide—has addressed the following letter to Mr. Worthington Smith. It is given in his own words :—

"Vir celeberrime, æstimatissime!

"'Clavem Agaricinorum' singulari voluptate recepi, et ob hoc munus gratias ago sincerrimas. Maxime me delectavit enumeratio admodum aucta specierum in Britannia lectarum comparationis gratia cum Suecanis. Nullus dubito in Britannia adhuc plures latere species, præcipue in pinetis Scotiæ; at multæ species nobilissimæ sylvis nostris abiegnis privæ, sc., *Lactarius scrobiculatis* et Cortinariæ majores in Britannia deesse videntur.

"Variæ insuper species ab amico Berkeley omissæ, quæ certe Floræ Anglicæ sunt; sc., *Ag. clavipes* ad quem absque dubio pertinet *Ag. mollis*, Bolton, *Ag. compressus*, Sow. ab *Ag. butyraceo*, et *Hygrophoro ovino* toto cœlo diversus et *Ag. metachrous* proximus, etc.

"Ad tabulam VI. operis hic addere liceat quasdam observationes.

"Locum vacuum seriei Leucosporæ inter 2 et 3, cum Pluteo, et Pilosace analogum, optime explet subgenus Hiatula in 'Nov. Sym. Myc.' A me descriptum, cujus immensæ species Tropicæ et 2 in caildaris nostriis, in caulibus orchidarum nascuntur. Loco simili lectæ Amsterdami, etc.

"A Pleuroti n. 6 excludendæ species resupinatæ.

"Maxime memorabilis *Ag. xanthogrammus* cum mihi nulla nota est species *velo partiali* inter Hyporhodios. *Ag. echinatum* ad Hyporhodios referre non possum, sporæ enim *non rosea* sedet *Ag. cretacei* et *Ag. campestris* simillimæ. Etiam *Ag. hæmatospermi* subfuscæ, nec roseæ. Hanc speciem nuper in Suecia legi et suspicor ad hanc pertinere *Ag. montanum v. cervarium*, Alb. et Schw. et *Ag. Hookeri*, Klot., annulus enim facile evanescit. Locum cum Lepiotâ et Psalliotâ

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intermedium in serie Derminorum occupat *Ag. aureus*, qui facile typum sui subgeneris (Togaria) sisteret, sed ex unicâ specie nolo novum formare subgenus.

"Hypholoma respondet ex parte Entolomatibus sed ex parte (sectio fascicularium) Flammulis. Flammulæ et Hyphol. fasiculares sœpe commutantur. Panæolus vero non in secundâ classe, sed in tertiâ ut Naucorïs et Psilocybis analogos collocarem, stipes enim subcartilaginus, velum in alïs adest, in alïs desideratur e.g. comparatis *Ag. fœniseccio* et *Ag. papilionaceo* analogia manifestissima.

"Nescio an tibi notum sit novum meum opus 'Icones Hymenomycetum.' Cum amicissimo Berkeley communicavi permultarum novarum speciarum icones.

"Valeas, Vir æstimatissime, et me in amicâ memoriâ serves.

"Ups. 10-8th 70. "E. FRIES.

"Quod Nylander et Hoffman (op. p. 26) appellant *trama*, meo sensu non est trama sed basis Hymenü. Trama meo sensu est substantia pilei intrans inter laminas lamellarum."

Translation.

"Most distinguished and estimable sir!

"I have received with peculiar pleasure the 'Clavis Agaricinorum, and for the gift I present my most sincere thanks. I was especially pleased with the list, so greatly enriched, of species found in Britain, for the opportunity it afforded me of comparing them with those of Sweden. I have not a doubt that there are more species still remaining to be discovered in Britain, particularly in the pine woods of Scotland: and many very handsome species peculiar to our own fir forests, for instance, *Lactarius scrobicularis* and the larger *Cortinarii* appear to be wanting in Britain.

"Several species, moreover, have been omitted by my friend Berkeley, which certainly belong to the British Flora; for instance, *Ag. clavipes* (to which without doubt belong *Ag. mollis* of Bolton) *Ag. compressus* of Sowerby, altogether distinct from *Ag. butyraceus* and *Hygrophorus ovinus*, but closely resembling *Ag. metachrous*.

"I may perhaps be allowed now to make some remarks on plate 6 of the book.

"The space in the series Leucospori left vacant between 2 and 3, anagous to Pluteus and Pilosace, is very well filled by the subgenus Hiatula, described in my work, 'Nov. Sym. Myc.' Of this genus there are numerous tropical species and two are found growing in our hot-houses, on the stems of orchids. They have been found growing in a similar situation at Amsterdam.

"We must exclude the resupinate species from the Pleuroti No. 6.

"*Ag. xanthogrammus* is chiefly remarkable from the fact that I know of no other species with a partial veil amongst the Hyperbodii. I am unable to refer *Ag. echinatus* to the Hyperhodii inasmuch as the spores are not rosy-coloured, but subfuscous, like those of *Ag. cretaceus* and *Ag. campestris*. *Ag. hæmatospermus* also has its spores subfuscous, and not rose-coloured. I have gathered this species lately in Sweden, and I suspect that *Ag. montanum*, var. *cervarium*,

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Alb. and Schw., and *Ag. Hookeri*, Klot. belong to it, for the ring is very evanescent. *Ag. aureus* occupies in the series *Dermini* the space between Lepiota and Psalliota which would readily maintain the type of its subgenus (Togaria), but I am unwilling to found a new subgenus from a single species.

"Hypholoma partly answers to the Entolomata, and partly (section Fasciculares) to the Flammulæ. The Flammulæ and the Fasiculares section of of the Hypholomata are often confused. The Panæoli, moreover, should not be in the second group, but in the third, since I should consider them analagous with Naucoria and Psilocybe, because the stem is sub-cartilaginous, and the veil is sometimes present, though sometimes searched for in vain—for example, on comparison there is a clear analogy between *Ag. fæniseccii* and *Ag. papilionaceus*.

"I do not know whether you have seen my new work 'Icones Hymenomyoetum.' I have sent to my dear friend Berkeley the figures of very many new species.

"Farewell, most honoured sir; bear me in friendly memory.

"Upsala. August 10th, 1870. "E. FRIES.

"What Nylander and Hoffman (Op. p. 26) call a *trama* in my view is not a trama, but the base of the Hymenium. The trama according to my definition is the substance of the pileus entering between the folds of the gills."

3.—In the *Gardener's Chronicle* for September 2nd, 1870, the following criticism was published, written by the Rev. M. J. Berkeley, author of the standard work on British Fungology, and well known as the highest authority in Britain on Mycological Science:—

"Clavis Agaricinorum: *an Analytical Key to the British Agaricini, with Characters of the Genera and Subgenera*. By Worthington G. Smith, F.L.S. London: Reeve and Co., 1870. 8vo. Pp. 40, with six plates.

"This memoir was originally read before the Woolhope Club, Hereford, Feb. 22, 1870, and we are glad that the author, who has done so much to illustrate the Fungi of this country, has thought fit to publish it separately, as it undoubtedly must prove a great help to every student of an extremely difficult tribe. We by no means assert, as some have done, that all difficulties are removed, and that now nothing is easier than to determine any species of Agaric. A line of the old algebraic problem in verse—

"He took it and tried, but it puzaled his prating,

would undoubtedly be the result if the critic went at once without any previous knowledge to the determination of almost any species of Agaric. No doubt the colour of the spores is a most important element in the distribution of Agarics into subgenera, but even this will sometimes prove a difficulty, as anomalies occur, and the tints are so very different in the Derminum section. Lepiota is confessedly very closely allied to Psalliota; indeed in those species which change their colour, and with the colour of the flesh at the same time that of the spores, it is often impossible, from the inspection of dried specimens only,

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to say whether we have before us a Lepiota or a Psalliota—a difficulty which has often puzzled the writer of this notice, in the course of describing a very large exotic collection of debateable species; and though the dried specimens were in almost every case accompanied by exquisite drawings, there was still room for frequent doubt.

"In every arrangement there will be anomalies. If we take the free gill as a characteristic of Lepiota, we shall not be long before we have species before us in which the gills are neither remote nor approximate, but decidedly attached to the stem, and this is still more evident in Amanita, where there are few species with really free gills, as in Volvaria and Pluteus. The same difficulty occurs in deciding whether the gills are truly decurrent in several cases, and we are, therefore, sorry that subgenera resting on such very slight characters as Tubaria and Deconica should have been proposed. *A. furfuraceus* is one of the most variable of Fungi, and almost every form of attachment may be found. After all, such species as *A. vulgaris*, *camptophyllus*, &c., are left in Mycena, where the gills are quite as decurrent as in either of the above-mentioned subgenera. We have no objection to the separation of *Agaricus variabilis* with its two close allies, but the slight tint in *A. cuosmos* is not sufficient to separate it subgenerically from *A. ostreatus*, and it has clearly no affinity with *A. variabilis*. We cannot assent to the separation of *A. cretaceus* from Psalliota, though we may approve of the keeping such abnormal species as *A. fumosopurpureus* and *A. echinatus* district, though they seem to connect Lepiota with Psalliota.

"If the colour of the spores is to be all in all, we must begin to cut up Hygrophorus and Lactarius, which could scarcely be done with advantage.

"These observations may wear a rather conservative appearance, but in truth the reform requires to be much deeper; the Friesian system, excellen as it is, and far superior, in our judgment, to every other, will undoubtedly some day require considerable modification, though we believe that it will always remain as the groundwork on which any satisfactory arrangement can be built *A. corticola* revives after a shower of rain as readily as a Marasmius, and yet no one would think of turning it out of Mycena, and we could point out many other anomalies. The subgenus Hiatula seems to have escaped Mr. Smith's notice, though possibly that, and one or two other Agaricoid subgenera, are neglected as being entirely exotic, though on the same ground Pilosace might have been excluded.

"Mr. Smith has appended a list of the British species, amounting to 701, which will undoubtedly be considerably increased. We cannot conclude this notice without expressing our admiration of the energy which the author of this little publication is continually exerting in a subject which is of daily increasing importance."

The following answer has been made by Mr. Worthington Smith to the observations of Professor Fries and the Rev. M. J. Berkeley:—

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(Gardeners' Chronicle, October, 1870.)

As the author of the work in question, perhaps I may be permitted to offer a few observations on Professor Fries' letter. I will do so in connection with the review which lately appeared in your columns, which, it is no secret, came from the pen of a botanist only second in his knowledge of Fungi to Fries himself.

I make no claim to originality in the work, for the scheme is more or less foreshadowed in Fries' works. The genera, subgenera, and species of the Agaricini may be compared with the pieces of a huge and intricate puzzle; of these pieces half are lost or unknown, the rest are almost inextricably disarranged and mixed up together. Now the problem is, how to set up these confused and imperfect pieces in such order as to show one continuous and perfect design. Fries has done this with some success, and all I claim is, to have made out one or two missing pieces, and to have re-arranged, with some trifling modifications, one or two others. These modifications, I consider, make the pattern clearer than heretofore, and it will be observed that neither Prof. Fries nor your reviewer dissent from my general idea.

I will now briefly remark on the observations of Prof. Fries, and on those printed in your columns in detail. First, as to the new subgenus Hiatula. The publication of this I overlooked, but I foresaw its position, and the only blank space on plate 1, to quote Fries' own words, "is well filled by it." Moreover, at p. 5 of my work there is a note respecting an Agaric which exactly fills this position. It is remarkable to me that this subgenus, its analogue Pilosace and Chamæota, are all foreign. It is my conviction, when foreign countries have been well searched, that every position of my scheme will be filled in. As it is, Fries suggests the filling of three additional positions.

Fries next says, that the resupinate species should be excluded from Pleurotus. As he has invariably included them himself, he can only be understood to suggest the formation of a new subgenus for their reception. To this I can see no objection, neither does it affect my arrangement in the slightest degree. Your reviewer says, under Pleurotus, that *A. euosmus* has no affinity with *A. variabilis;* this I grant, but neither has it any affinity with *A. mitis* or *A. acerosus* amongst the Leucospori, where it was formerly placed. *A. popinalis* is associated with the Hyporhodii, but its spores are whiter than those of *A. euosmus.*

Fries says he is not able to refer *A. echinatus* to the Hyporhodii; your reviewer says he approves of keeping it distinct, as it connects Lepiota with Psalliota; this latter was my reason for removing it, *i.e.*, not so much on account of the spores not being purple-brown, but because the plant was exactly intermediate in position between Lepiota and Psalliota. It is true that the spores in Lepiota change colour in the dried plant, as stated by your reviewer, but this is only because the spores become tinged with the juices of the plant, and not because they change in themselves. I have spores of most of the

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Lepiotæ preserved (and yet exposed to the air), that have retained their perfectly white colour for ten years or more.

The subgenus Togaria, mentioned by Fries, fills up another blank space on plate 3 of my "Clavis;" it occupies the middle position of the top three spaces. It is again curious that the typical plant should not be British.

Fries next refers to Hypholoma and its analogy with Entoloma and Flammula, and says that the "Fasciculares" group of Entoloma is analogous with Flammula; this is undoubtedly true; but Flammula is at present badly contituted, and some of the plants have no affinity with each other. It follows, therefore, that the following British species, viz., *A. sublateritius*, *A. capnoides*, *A. epixanthus*, *A. fascicularis*, and *A. dispersus*, instead of being placed at the head of Hypholoma, as heretofore, by Fries, Berkeley, and others, must come in at the end, and fill the blank position on plate 4, which is analogous with Flammula on plate 3.

Before leaving the Dermini and Pratellæ, I will briefly touch upon your reviewer's remarks on my subgenera, Tubaria and Deconica; they are not, as he states, founded upon the slight characters of decurrent gills, but decurrent gills accompanied by other characters, as the depressed pileus and the nature of the margin. The difficulty respecting such species as *A. vulgaris*, quoted by him as being still left in Mycena and not removed to Omphalia, I have referred to at p. 14, under the "Mycenariæ" of Omphalia; the reference to *A. camptophyllus* being left in Mycena, and not removed to Omphalia, is especially unfortunate, as I have placed it in Omphalia, and not in Mycena.

The Panæoli are mentioned in conclusion by Fries as more analogous with Naucoria and Psilocybe than with Hypholoma. The hollow stem and appendiculate veil, however, of *A. fimiputris* and its allies appears to me to bear a manifest analogy with the "Appendiculati" group of Hypholoma. The subgenus Panæolus will on proper study probably bear subdivision. I am of opinion that the colour of the spores is by no means a character of the first importance amongst Agarics, and at page 3 of my work I clearly say that the alliance of the species would be closer if the points of structure were followed. Therefore I certainly do not consider the colour of the spores to be "all in all." As to the genus Hygrophorus, that could not be cut up, as all the species have white spores. I imagine Fries would not have founded the different subgenera of Agaricus on such a character as spore colour, if he had had such salient points of distinction as we find in Lactarius and Russula under "Piperates," "Dapetes," "Limacini," "Rigidæ," "Fragiles," &c. As to the "trama" in the gills of Agarics, and its value as a character, the subject still wants working up. Fries, however, is clearly right in asserting its absence in *Paxillus involutus*, and Nylander and Hoffmann are mistaken.

The first plate shows at a glance any modification of the arrangement of Agarics with white spores. Those with coloured spores are analogous. It differs from that of Fries in the removal of Pleurotus from the bottom right-hand corner position to the one above it; and in the transposition of Om-

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phalia and Mycena (see "Monographia Hymenomycetum," pp. 177, 195); of course I suggest a similar transposition of those subgenera of Agarics which have coloured spores.

The position of Fries' new subgenus, Hiatula (which was unknown to me when my pamphlet was printed), but which I had provided a space for, is shown by the blank position at the top right-hand corner of the first plate.—*Worthington G. Smith, North Grove West, Mildmay Park.*

Fourth, and lastly, the "Clavis Agaricinorum" has been again re-published in full, and its arrangement closely followed, by Mr. M. C. Cooke, in the excellent "Handbook of British Fungi," now in course of publication.

The correctness of Mr. Worthington Smith's views as expressed in the "Clavis Agaricinorum" is thus placed beyond doubt. During the very few months it has been published it has received signal approval. It makes no claim to scientific originality, and yet it secures it, by the clear and simple arrangement by which it brings forward facts previously known. To the student in this difficult branch of Mycology it cannot be otherwise than most advantageous, since it cannot fail to impress vividly on his mind the great importance of observing *accurately* the leading characters of the Agarics. The "Clavis" has thus gained for itself a place in all class books on Funguses.

To Mr. Worthington Smith this favourable verdict of Science must be very gratifying, and the Woolhope Club rejoices with him the more readily for the position the success has given to their own proceedings.

Postscript. As these pages were passing through the press another letter was received from Professor Fries, dated January 22, 1871. In that letter Fries suggests the removal of *Agaricus reticulatus* and *A. aleuriatus* from the subgenus *Galera* into the top right hand *blank* position of Plate III. of Mr. Smith's "Clavis." Fries considers these two species to be the type of a new subgenus analogous with *Pluteus* on Plate II. and Hiatula on Plate I. For this *third* blank position filled by Fries he suggests the name *Pluteopsis*. The members of the club will at once perceive the correctness of the Swedish Botanists' views, as both the species in question have *free* gills and a parasitic habit, like the analogous *Pluteus* and *Hiatula*.

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ON SOME CURIOUS ALGÆ ONLY APPARENT IN TIMES OF DROUGHT, WITH NOTICES OF THOSE THAT OCCUR AND COLOUR WATER AT SEASONS OF HIGH TEMPERATURE.

BY EDWIN LEES, ESQ., F.L.S., F.G.S., &c.

VICE-PRESIDENT OF THE MALVERN AND WORCESTERSHIRE NATURALISTS' CLUB.

The drought of the summer just past, if not altogether unprecedented, has been of such an exceptional character as to arrest general attention and commend itself to the special regard of the Meteorologist. Into the particular details of temperature and barometrical pressure I am not about to enter, only remarking, that the temperature of the successive weeks since April (1870) to the present time, as stated by Mr. Glaisher, from observations made at Greenwich, has exceeded the average temperature for the last fifty years by an amount varying from three to thirteen degrees as the maximum; while the rain that has fallen has been so small in quantity as to be scarcely measurable. Consequently, rivers not dammed up by weirs, have become very low, the weirs themselves have been mostly dry, mountain streams have been reduced to mere threads of water, and numerous pools have been entirely dried up. On the hottest days in several places, the recorded observation of temperature in the shade has been 90° Fahrenheit, while in the sun as high as 151° has been attained.

Mr. Plant, an eminent meteorologist residing at Birmingham, which has generally a greater amount of rain than the vale of Worcester, or indeed the vicinity of Hereford, has stated, that for four consecutive months from the 4th of March to the end of June this year (1870) he has only recorded a rainfall of less than four inches, against the usual average of twice that amount, "a dryness unequalled in the corresponding months of any year since the memorable drought of 1844." Technically, the three spring and summer months to the end of July, showed a deficiency of more than six inches of rain, which, translated into understood popular language, means that there was 3,000 hogsheads per acre short of the usual supply.

It may be mentioned that this drought was not only felt in England, but was general over Western and Central Europe. In the south of France trees perished and many vines became dead. Even the *Opuntias* of the Cactus tribe, as I learned from a correspondent, in spite of their succulent habit, became dry and hard as horn. This excessive dryness and corresponding desiccation of the soil, with an almost entire cessation of rain during the spring

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and summer months, has caused the drying up of many ponds all over the middle and southern parts of England, and as far as my own experience goes, I never knew such a number of bottoms of pools exposed to the sun and air, and courses of brooks reduced to narrow threads of water; in fact, several pools that I never before observed to be bereft of water, have this year yielded to the continued drought, while grasses and ordinary weeds have, in numerous instances, occupied the place of dry and withered water-plants.

The drying up of numerous pools, in such a continuously hot season as the present one has been, must be obviously destructive to a great amount of animal and vegetable life, more especially in the minute forms of both. The Pond-weeds *(Potamogeton)*, Duckweeds *(Lemna)*, the Hornworts *(Ceratophyllum)*, Water-milfoils *(Myriophyllum)*, as well as *Zannichellia*, *Callitriche*, *Hydrocharis*, the *Characeæ*, and other aquatic plants, must of necessity perish; and here the Darwinian maxim of "the survival of the fittest" will not apply, as the meteorological conditions produce the destruction of all alike. The suppression of vitality in the *Zygnemæ*, *Confervaceæ*, *Chetaphoreæ*, *Vaucheriæ*, *Oscillatoriæ*, and the minuter forms of vegetable life must be incalculable; while Newts and other aquatic reptiles, various small fishes, as well as the larvæ of Water-beetles, Dragon-flies, and other insects that inhabit ponds, must of necessity perish. So, in like manner, the genera *Lymnæa*, *Planorbis*, *Ancylus*, and other Water-snails, besides thousands of *Infusoria*, nourished at all times in stagnant waters, must be involved in the general destruction.

When the naturalist only thinks for a moment of the numerous minute organisms thus enumerated that inhabit stagnant waters, it must be evident that countless multitudes of the minute and obscure forms of both animal and vegetable life that inhabit

"The green surface of the stagnant pool,"

and the water beneath this green film, must have entirely perished, and been altogether swept away from the scene of existence. Those who have studied the infusorial world microscopically, or the cryptogamic botanist who has been in the habit of taking water from stagnant pools to examine the almost infinite forms of the *Confervoideæ*, the *Desmidiaceæ*, and the *Diatomaceæ*, as well as the unicellular *Algæ*, will be better able than the casual observer to form an idea of the countless forms of beings that are reduced to lifeless atoms by the drying up of the ditches and pools of water. Having of late years often amused myself with observing the varied forms of minute vegetation that abound in pools and stagnant water, I will exhibit a few to you that those unfamiliar with the subject may form an idea what a world of wonders is in such places hidden from the unscrutinising eye, yet ready for the revelation of the microscope; and it is here, on the mystic boundaries of animal and vegetable life, that it is sometimes impossible to determine to which an observed form may belong, for one organism simulates another, and animal and vegetative life in some cases seems to be alternatively displayed by the same existence. But on that disputable topic I shall not enter, only remarking that the extinguishment of

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animal and vegetable life, from meteorological causes, which has probably ever been going on upon the earth's surface, deserves thoughtful attention, and if it extended no further than the drying up of numerous ponds in a country subjected to a continued amount of increased temperature, is a remarkable fact in Natural History.

[A number of drawings of minute microscopic Algals were displayed by Mr. Lees, and were attentively examined.]

Still, amidst destructive influences, novel conditions induce special growths and appearances, and thus minute plants present themselves to view not observable at other times, and chiefly, if not entirely, under these altered circumstances.

I shall adduce two minute organisms that have come under my notice this summer, and which only appear under conditions of high temperature, that they take advantage of, and which therefore entitles them to the appellation of Meteoric Plants.

One of these is a little green, bubble-like Alga, that bears the name of *Botrydium granulatum*, the generic term being derived from the Greek *botrys*, the plant putting on the appearance of little bunches of grapes, more, in fact, like an assemblage of minute bubbles of green glass. It is only on the exposed mud of ponds that have lost their water that the Botrydium appears, so that it is useless to look for it except in very hot summers; and consequently, though abundant in particular places suitable for it in this very exceptionable season, years may elapse ere it appears again, and the beds of ponds bereft of their water be exposed to view. By some authors this little Algal is called *Hydrogastrum*, and is placed, as a genus of *Siphoneæ*, among the *Confervoid Algæ*.

I have found this obscure Algal, under the circumstances adverted to, during the present summer, not far from Dovedale, in Derbyshire; and in some abundance in a secluded dried up pool at Mathon, in Worcestershire; rather plentifully at Powick Ham, near Worcester; as well as at Colwall, in Herefordshire. It forms a green stratum of little globules in the first instance, which are rooted in the damp soil, and chequered with white specks on the exterior surface, so that, on the mud of a dry pond where it is plentiful, the surface has the appearance as if a hoar-frost had covered the ground, while the globules crackle under the feet as when treading upon grass encrusted with frozen particles. I have made magnified sketches of the plant; but it is curious that the inflated vesicles—similar to minute globules—are only the plant in its first stage of growth, and not its ultimate appearance. The vesicles collapse without bursting, and then present a concave appearance, like a mass of crowded *Peziza*. The vesicles previously separate now combine, and a green united crust or frond presents itself to view, very much like an *Ulva*, to which tribe the *Botrydium* bears considerable affinity, and indeed it was called an *Ulva* by *Linnæus*.

Though Dr. Greville has described and figured the *Botrydium* in his

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"Algæ Britannicæ," yet his examination was unsatisfactory, as he could detect no fructification, and says the vesicle is "filled with a watery fluid, which escapes by an irregular terminal orifice." This is not the case, as no orifice could be detected either by myself or my friend Dr. Holl, who has carefully observed the plant under his microscope; and though a little moisture occasionally exudes when the vesicle is crushed, yet it seems really to be inflated with air, which may readily escape without a terminal orifice; and, in fact, a continuous cavity runs through the entire plant.

Having had the plant under notice for several years, I think that I am now familiar with its structure and economy, though to understand the former requires a very careful eye. From its peculiar position, it is difficult to catch it in its first state, when the whole plant is invested with a thin pellicle or swaddling cloth, so to speak, forming several membranes or lamellæ, which it bursts through, and then appears as a polished green globule, mostly scattered over with granular specks on the surface, which are the relics of the thin membranes it has burst through. This second globular form does not last long—a day or two at the utmost—when the globules quietly collapse, and, forming a junction with each other, an extended green frond or crust presents itself, appearing very much like an *Ulva*, and which may exist, if the mud on which it is fixed remains moist, a considerable or unlimited time; but under the influence of the sun it soon withers up into a white efflorescence.

The vesicles are often crowded together in little tumps, like cushions, made up of innumerable globular vesicles, so minute as scarcely to be visible to the naked eye, and these appear to be proliferous masses attached to one branching root. When examined under the microscope, the vesicles are seen to collapse in a very curious way, each vesicle sinking into a concavity without any rupture of the epidermis of the vesicle, the moisture within, if any, sinking through the funnel-like tube below. This collapse of the vesicle goes on rapidly, yet almost imperceptibly, until the globules have all disappeared, and only an extended green frond appears to view, which is the last state of the Botrydium.

The collapse of the vesicle seems to be a mere desiccation, for there is no aperture for the escape of moisture, and the collapse places the vesicles in their secondary *ulvoid* state, when by their junction they form a frond, differing much in appearance from their original grape-like aspect.

The vesicle appears to consist of two transparent membranes, between which is a mass of granular matter bearing some resemblance to a *Chlorococcus*, but with frequently only a single granule in a cell. These cells are very numerous, and, in the breaking up of the vesicle, may sometimes be seen to spread out in a flowing stream under the microscope, but generally they remain inactive.

The vesicles are attached to the mud in which they grow by long divided threads or roots, and in general these threads support but one vesicle; but where bosses of very crowded minute vesicles present themselves to view, as

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is sometimes the case, it is probable that these smaller vesicles are proliferous, like the cæspitose Agarics, and these minute tufts appear to wither without any collapse, remaining unchanged and barren. The vesicle seems only to contain air and a slight liquidity, though sometimes minute threads are observable, but the sides of the vesicles contain a crowd of cells or chlorophyl globules, which in maturity are closely agglomerated together, and have been called "gonidia," by Itzigsohn, probably analagous to gemmæ, by which the plant is perpetuated. No other fructification is apparent. The cells part with the minute granules or gemmæ they contain, which are deposited in the mud, and there rest to await a favourable time for renewing the plant in crowded inflated globules as before. The ulvoid state of the plant shows at last only empty cells, and after a few days existence it withers and disappears.

The *Botrydium*, in its first vesicular state, is very evanescent, for unless the mud on which it grows is kept moist, it altogether dries up in three or four days, leaving only a whitish inconspicuous efflorescence, and it is consequently very difficult to preserve specimens except between glass. It is most curious that the vesicles, which are at first separate, unite after collapsing, and then form a green crust or frond of indefinite extent, which when examined under the microscope is found to consist of round cells or gonidia, closely approximate at first, containing gemmæ or granules, by which the little plant is propagated; but it is difficult to observe the escape of these granules, though the cells at last are found empty.

In hot seasons, several kinds of brilliant-coloured *Algæ* appear either on the surface of stagnant water, colouring the water itself that is reduced to puddles, or staining the mud, stones, and slabs lying in the water. A remarkable appearance of this kind came under my view in the bed of the river Manifold in Staffordshire, a few weeks ago. I should remark that in hot summers the bed of the river Manifold becomes dry for an extent of more than four miles, and the bed of the river consists of mountain limestone worn by the stream into strange serratures and inequalities, with here and there a barrier of rock across the course of the stream, forming in winter rapids and cascades with great boulders at intervals blocking up the way. A walk up this exposed bed is one of the most remarkable traverses that a naturalist can make, and it is not to be accomplished without some difficulty. In several places, taking advantage of the cessation of the watery flow, a mass of the *Petasites vulgaris*, with its long-stalked gigantic leaves, chokes up the rocky bed of the river, through which the wanderer must wade breast high and push on with considerable trouble.

At intervals I observed the rocks and boulders in the bed of the stream to be *coloured red* on their surface, and where little spreads of water remained they were *crimsoned* as if with diluted blood; so that if any person had been missed and supposed to be murdered, a detective policeman might well have believed that here undoubted traces appeared of the course taken by

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the murderers, and where they might have washed their crimson-stained hands. One little pool left in the bed of the river was particularly sanguine in aspect, and all round its margin a space was reddened on the stones, very much resembling blood. I here collected some capital specimens, and on subjecting these to the microscope on my return home, they proved to be a *remarkable cellular Algal*, representations of which I have carefully sketched. It is an undoubted Algoid plant belonging to the family of *Palmellæ*, and is very near if not identical with what Dr. Hassall has called *Sorospora grumosa*. The frond is of a brick-red colour, the globules blood-red, filled with granules, and surrounded by a narrow pellucid margin. It is stated in Griffiths and Henfrey's "Micrographic Dictionary" that *Sorospora* is a genus of Palmellaceæ not clearly distinguished from *Glœocapsa* and *Protococcus*. My plant is certainly allied to *Protococcus*; it is covered with a pellucid membrane, and its structure is very similar to *Protococcus viridis*. But the vivid crimson of my Algal is remarkable when mature, though small immature separated cells are pale green and orange. The gelatinous covering often remains in torn patches upon the cells, and the included granules are very numerous, which makes it different from *P. viridis*. I have found this same sanguine production upon a rock left dry in the river Wye, in Radnorshire, and also on stones in the bed of the river Dee, in Merionethshire. This, probably, is the organism on the "red-spurtled" stones at St. Winifred's Well, Holy-Well, Flint, said to be marked with the virgin saint's blood.

There is another red Algal, named *Protococcus pluvialis*, found occasionally in rain-water, or on roofs after rain, and which is at first covered by a thin integument, that, bursting, displays the crimson cell filled with granules beneath. Some of these Algals increase so rapidly, that in Wiltshire I have seen an unused canal with its surface made of a vermillion hue for a mile or more, singularly contrasting with the neighbouring green meadows.

These coloured cellular Algæ are developed either on the surface of shallow water, or on the mud of pools left exposed to the sun, and hence has arisen the tales of bloody ponds, and water turned into blood, denoting, it was vulgarly believed, some dire calamity about to happen. A few years since, a shallow pond at Mathon, on the borders of Herefordshire, and the mud around it, assumed a sanguine aspect from a species of *Palmella*, which rather frightened the natives thereabout; and I have seen a damp rock in Switzerland thus crimsoned. I saw a pond at Bell-broughton also encrusted with another species of red Algal. My friend, Mr. Ponting, two years since, directed my attention to a pond not far from Eastnor, which *had a sanguine aspect*, but which was undoubtedly caused by one of the INFUSORIAS, named *Astasia Hæmatodes*, which, however, in a dry and dead state, can scarcely be distinguished from an Algal, and when living changes its form most remarkably. My friend, the Rev. Andrew Bloxam, informs me that this Algal has appeared this year on a pond at Twycross, Leicestershire. Another red Algal, called *Palmella cruenta*, or the "Gory dew," may be occasionally seen on the ground, or at the

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foot of walls, in ominous patches, and has often been taken for *blood spilt there;* and it is some kind of Algal, called *Protococcus nivalis*, that colours the red snow on the Alps seen occasionally by travellers. The *Hæmatococcus* is another cellular Algal that is of a sanguine hue; and the various lakes and pools that assume deep green, red, and other colours, owe their different tints to Algæ that come to maturity under circumstances of high temperature. At such times these various cellular structures seem to increase in an astonishing manner. All these cellular forms require careful investigation, and their appearance and changes should be recorded, for, as remarked by Griffiths and Henfrey (*Micrograph. Dict.*), the genus *Protococcus* is "at present very imperfectly known, since, without a tolerably complete history of the development of their forms, it is impossible to distinguish the true species of *Protococcus* from the young states of the more complicated *Palmellaceæ*."

I cannot on the present occasion go farther into this subject, curious as it is, but it may excite the attention of the members of the Field Clubs to carefully look out for the appearances that arise in Nature *under changed circumstances*. For though, as is evident, destructive influences may, in the order of things, be influenced by oscillating meteorological cycles which we cannot fully understand, and destroy a little world of minute creatures in their limited range, yet renovation follows so closely upon the heels of ebbing life that a void place seldom long remains, and other organisms appear to take advantage of the opportunity that presents itself for their enjoyment of active vitality. A drought may extinguish animal and vegetable life in particular places, but there is at length a providential compensation; showers return to gladden the soil, springs and pools are renovated, and every drop of rain is loaded with the germs of existences that quickly give life again to the spots that had been only for a brief space left arid and bare. Those peculiar plants which the drought had brought into transient existence then entirely disappear from view. Destruction and renovation are perpetually at work in the wide domain of Nature, and the rolling year shows continual change as an evidence of Divine and providential ordination. No animal or vegetable life is indestructible, but on the ashes of destruction renewed vitality appears in other organisms that take their turn within the cycle of existence. Death, after a longer or shorter time, invariably succeeds to life, and perhaps even with reference to an Almighty power, it may be impossible to carry on such an extended system of vitality as we see around us on any other foundation.

> All forms that perish other forms supply,
> By turns they catch the vital breath, and die;
> Like bubbles on the sea of matter borne,
> They rise, they break, and to that sea return.

We perceive that meteorological causes, the origin or continuance of which is altogether inscrutable, involves an enormous destruction of life—both animal and vegetable; but this does not go on indefinitely, or without limit; there comes a change, and the face of Nature is again renewed. Some existencies, that could appear only under an exceptional state of things, pass away to await

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another opportunity of re-appearing; while, from sources that were left untouched, barren spots are again revivified, and the unexhausted stores of vitality —ever latent, ever incubating, and dormant only for a time—are again roused to action, and the enormous powers of multiplication, possessed more especially by the lower orders of plants and animals, soon replaces the sterility that could only endure while the ordinary course of Nature in seasonal progression was disturbed or intensified. The changes that occur in the aspect of Nature demand the continual attention of the naturalist, and it becomes his duty to carefully observe them, not caring to attempt the formation of a theory as to their recurrence till the accumulated stores of observation give a sufficient foundation of facts on which truth may indubitably rest.

It is instructive, however, to perceive how variable existence is kept up; the death of one organism awakening life in another, and the minuter objects whose sporidia seem to pervade everything, rise before the eye more and more minutely until the microscope is required to detect their presence. But there they are perceptible, and experiment as well as experience alike show that these motes of existence may rest long undeveloped till favourable or peculiar circumstances call them forth to fill up the chinks of space they were destined to occupy. The changes and alternations of life which drought and other destructive influences cause, may well justify what a deep-thinking poet has declared in emphatic rhythm, and with which it will not be inappropriate to conclude a scientific inquiry:—

> Look Nature through, 'tis revolution all.
> ——————— all to reflourish fades;
> As in a wheel all sinks to re-ascend.
> . . . . . .
> The world of matter with its various forms
> All dies into new life, life born from death
> Rolls the vast mass and shall for ever roll;
> No single atom once in being lost.
>
> *Dr. Young.*

(Applause).

Dr. Trimen, of the British Museum, at the President's request, made some short observations on Mr. Lees paper, which he characterised as one which showed a great amount of hard work, and of which no society in the kingdom need be ashamed. With reference to the nature of the minute organisms found on the mud of dried-up ponds, he suggested that not a few might be conditions of well-known species due to altered circumstances. The *Botrydium* described and figured by Mr. Lees was, however, no doubt, an independent species, and in connection with it Dr. Trimen mentioned a small European grass, *Coleanthus subtilis*, which occurred in several European countries, but only at the end of exceptionally dry summers, on the floor of dried-up ponds, and therefore very irregularly. After the very dry season of 1868, it was found in several places in Brittany, and is not unlikely to turn up in this country. The conditions which usually stimulate the growth of minute *Algæ* are dependent on damp, as every one must have noticed who has seen the coloured

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patches which appear after rain on walls and houses caused by species of *Lyngbya* and *Protococcus*. The most remarkable case, however, of colouration by such a cause is that of the *Pedras negras* (Black rocks), in Angola, West Africa. These had been noticed by the old Portuguese travellers centuries back, and described by them. When Dr. Welwitsch, the celebrated African traveller, visited, a few years back, the district of Pungo Andongo, in which these hills occur, he, however, saw them to be of a pale yellowish, grey colour, rather darker at the summits. This was in October. In the next month heavy rains occurred, and a few days after, Dr. Welwitsch, on visiting the district again, observed the hills to be black from the summit to the base. On proceeding to the base, an examination quickly showed the colouration to be due to a filamentous *Alga* of the genus *Scytonema*, which covered miles of the hill-sides. It appeared to take its origin from pools at the top of the hills. When the dry weather set in, it dried up and became white, and soon peeled off, leaving the hills their natural colour (applause).

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DETAILS OF BOTRYDIUM GRANULATUM.

1. The Vesicles of the natural size and appearance.

2. The Vesicles after collapsing, forming a green confluent frond, the natural size.

3. The Frond enlarged, showing the hollows left by the collapsed vesicles.

4. The Vesicles separate and magnified, showing their tubular shape and fibrous termination.

5. A Vesicle in its primary state, with the thin membranes that surround it, magnified.

6. Vesicles perfect after bursting through the membranes, with their granular relics left on the surface, magnified.

7. Cells or *Gonidia*, with their included granules or germs, magnified 200 times.

8. The same farther magnified 500 times.

9. Cells or *Gonidia* emptied of their contents, magnified 200 times.

DETAILS OF THE RED ALGAL FROM THE MANIFOLD.

10. Crust or frond, blood-red, formed of innumerable confluent cells.

11. Cells and their included granules, with the remains of the membrane that at first covers them, magnified 200 times.

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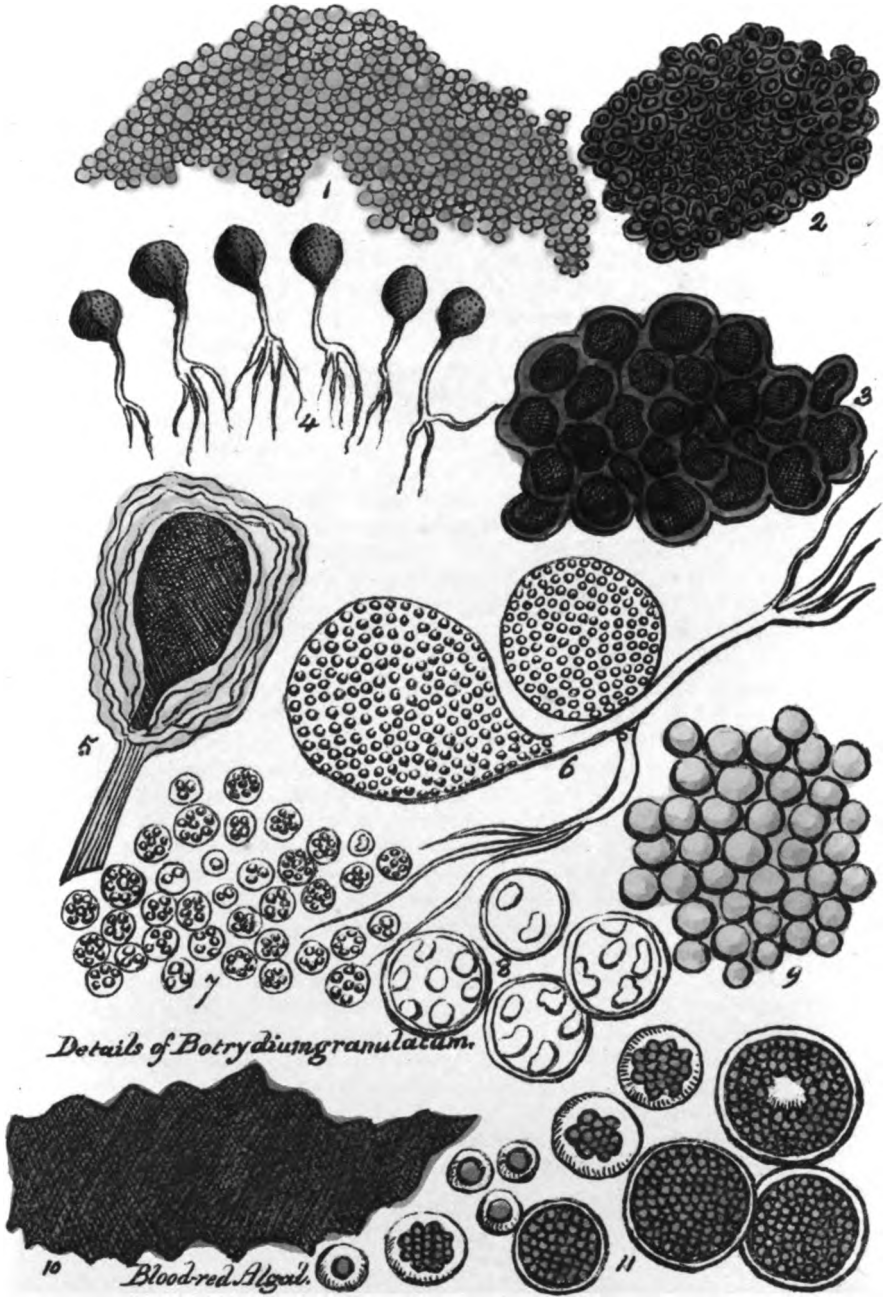

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NOTES ON FAIRY RINGS.

BY JAS. BUCKMAN, Esq., F.L.S., F.G.S., &c., &c.

PART I.—DIFFERENT THEORIES OF FAIRY RINGS.

There are few people so incurious as not to have had their attention arrested by the peculiar green and brown circles in meadows to which the name "Fairy Rings" has been given. The name itself indeed suggesting a degree of popular mystery and superstition connected with them.

We purpose in this article to make the attempt to unravel some of the mysteries which the rings encircle, while we review the subject of the origin and formation of Fairy Rings.

When the new grass of the meadow is beginning its spring growth we are made aware of the presence of more or less perfectly formed circles, sometimes occupying the undulating slopes of the hill pasture, at others here and there dotting the richer lowlands. These vary in size from a few inches to many feet in diameter. Often the circles are most complete and regularly formed, but very many of them are only arcuate, while others appears as though they had been formed of two intersecting circles, which by their union make a double bow.

If we examine them carefully at this time we find that they are composed of two circles, one within the other, or rather each is composed of two bands, an outer one of more or less brown herbage and bare soil, and an inner one of fresh green grass growing much more luxuriantly than the next grass of the meadow. In one of our own meadows we have this day examined perfect or imperfect circles to the number of fifty in a space of five acres; of these the smallest was 3ft. and the largest 24ft. in diameter. Many of these circles consist of a green ring only, but in an orchard at the bottom of this meadow are two most perfectly formed circles, one of 15 the other of 24 feet in diameter, in which the brown outer band is very conspicuous; and on yesterday, digging up some of the soil, we found it impregnated with the mycelium or spawn of a fungus, emitting an agreeable fungoid odour, and next month we shall hope to gather a good harvest of the "May Mushroom" *Agaricus Gambosus* from the larger circle, while in the summer the brown ring of the smaller circle will be occupied by the Champignon *Agaricus oreades*. There are other rings on the form occupied in their turn with *Agaricus arvensis*, our larger catsup mushroom—The *Ag. personatus* —"Blewits" and other "fairy ring" species. Sometimes the same ring will produce most, if not all, of these species at different times.

We have here then to consider the important fact which has been

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hitherto overlooked, that Fairy rings either may or may not be occupied by fungi, and hence then the theory that the rings are caused by them, to say the least, is not always true.

That fungi are the usual accompaniments of Fairy-rings is certain, but as we shall ultimately determine these are the results of the circumstances by which such rings are formed, and not the real cause of all the phænomena which we have observed.

Still, that such conspicuous objects as the Agarics we have named are common to these rings is certain, and there is no wonder then that different writers in explaining the facts should always refer to the fungi, as the true cause of the ring is not to be wondered at, though at the same time this wrong assumption has, as we think, been the cause of gross errors in the conclusions arrived at. Thus Professor Way, in a paper on the "Fairy-rings of Pastures," in vol. 7 of the journal of the Royal Agricultural Society, offers the following remarks :—

"Omitting the consideration of the many theories which have been offered in explanation of these curious rings, I shall only remark that by far the most scientific and intelligible solution of the question is that which was based upon Decandolles theory of excretion of plants. It was supposed that from one cause or another the germ of a fungus or agaric became deposited on some point of a piece of pasture land ; that the fungus formed from it, after passing through the various stages of its growth, sheds its seeds or sporules necessarily in a circle exterior to its point of connection with the ground, and that in the following season a series of these plants was produced in the form of a small circle. This new crop would, in its turn, come to maturity, shedding seeds both towards the centre and the outside of the ring. Were circumstances favourable to the development of the seeds deposited on the inside of the ring, the diameter of it might increase, indeed, but it would have the form, not of a ring with an open centre, but of a flat disc. This, however, does not take place ; the fungi of one year are replaced in the next by a crop of luxuriant grass, to whose superior height and dark colour is due the appearance of the ring itself. Now, it was argued upon the Decandollian theory that the excretions of the fungus were in the highest degree injurious to its subsequent development on the same spot ; but that, on the other hand, they were particularly favourable to the growth of the grass which followed them. It may easily be seen that this explanation is abundantly sufficient for every circumstance of the case, if the theory of Decandolle as to the excretions of plants were generally tenable. It is needless for me to remark, however, that this theory has been abandoned by most vegetable physiologists, and has lately met distinct confutation from the laborious investigations undertaken by Dr. Daubeny, on the rationale of the rotation of crops. It becomes then necessary to seek some other explanation for the formation of the Fairy rings. In the spring of this year (1846) it occurred to me to make a chemical examination of these fungi with the hope of

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throwing light upon their peculiar growth, and I was favoured with an excellent opportunity of making this examination from several magnificent rings growing on the pasture land surrounding the Agricultural College. Now we have reason to know these rings as they afforded us many a meal of most delicious mushrooms, and always about the first or second week in May, and we ascertained them to be the true St. George's mushroom, *Agaricus gambosus*."

It was this species then which was analysed by Professor Way, and we here give ash analyses of the fungus, and also of the grass from some of the fairy rings:—

ASH ANALYSES BY J. T. WAY, ESQ.

	Fungus.	Grass.
Silica	1.09 ...	16.10
Lime	1.35 ...	10.47
Magnesia	2.20 ...	2.49
Peroxide of iron	trace. ...	2.93
Phosphoric acid	29.49 ...	6.54
Sulphuric acid	1.93 ...	5.40
Carbonic acid	3.80 ...	12.47
Potash	55.10 ...	35.23
Soda	3.32 ...	none.
Chloride of Sodium	0.41 ...	5.79
	98.69	97.42

On the foregoing analysis the Professor remarks: "I think we may clearly explain the whole growth of the Fairy-rings. A fungus is developed on a single spot of ground, sheds its seed, and dies. On the spot where it grew it leaves a valuable manuring of phosphoric acid and alkalies, some magnesia, and a little sulphate of lime. Another fungus might undoubtedly grow on the same spot again, but on the death of the first the ground becomes occupied by a vigorous crop of grass, rising like a Phœnix on the *ashes* of its predecessor." If the grass shared the fate of the fungus again withering and dying on the land its growth might continue, the circle might increase and remain as before supposed, in the shape of a disc; but in fact this does not occur—the grass is either eaten off by cattle or taken away in the form of hay and with it is removed the greater part of the inorganic materials which the fungus had collected," Berkeley, in his "Outlines of British Fungology," has adopted somewhat the same views, for, in speaking of Fairy-rings, he says, "These rings are sometimes of very ancient date, and attain enormous dimensions,* so as to be distinctly visible on a hill side from a considerable distance. It is believed that they originate from a single Fungus, whose growth renders the soil immediately beneath unfit for its reproduction. The spawn, however, spreads all round, and

* We have seen some on Salisbury Plain nearly 30 yards indiameter.—J. B.

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in the second year produces a crop, whose spawn spreads again, the soil behind forbidding its return in that direction. Thus the circle is continually increased and extends indefinitely till some cause intervenes to destroy it. If the spawn did not spread on all sides at first, an arc of a circle only is produced. The manure arising from the dead Fungi of the former years makes the grass peculiarly vigorous around, so as to render the circle visible even when there is no external appearance of the Fungus, and the contrast is often the stronger from that behind being killed by the old spawn. This mode of growth is far more common than is supposed, and may be observed constantly in our woods, where the spawn can spread only in the soil or amongst the leaves and decaying fragments which cover it." p. 41.

Now it may be quite true that the authors quoted have accounted for some of the observed facts; yet, as remarked by my acute friend, Mr. Edwin Lees, "Even Mr. Berkeley takes the supposition about the single Fungus forming the circle, for granted, without due examination himself, and says 'It is believed that such is the case.' Now after attentive observation, I myself do *not* believe it." After some further remarks this author makes the following important statement, which we quote as being perfectly in accord with our own observations:—"All fungi, whether Agarics, Boleti, or Polypores flourish on decaying substances, and rotting matter of some kind they require as a pabulum of support. Whatever then, causes the withdrawal and death of grasses in pastures or displaces the soil, enables the sporules of fungi to settle down, and Agarics or 'Toad-stools' to appear, and thus we notice them scattered about, without much wonder at their appearance, in the autumnal season, for as Shelly says—

Agarics, fungi, mildew, and mould,
All start like mist from the wet ground cold.

But they do not start without some predisposing cause, or without something or other has caused decay when they arise."† Here then we have the important fact that decaying matter is necessary to the production of our Agarics, and it was doubtless this browned and withered state of the grass by which fungi are preceded that induced some to believe that they were produced by electricity, thus Dr. Darwin, a botanical poet, says—

So from the clouds the playful lightning wings,
Rives the firm oak, or prints the Fairy Rings.

And Mr. Lees tells us that "Mr. J. Dovaston, in Loudon's Magazine of Natural History,' like Darwin, ascribed the exciting cause of the formation of rings to 'strokes of electricity,' which laying bare the ring the first year, by 'the fertilization of combustion' gave rise the second year to a crop of grass with highly increased vigour and verdure.' This fertilization however, Dovaston remarks, though violent is of very short duration, and thus the circles soon disappear. It may be well to remark that both Aubrey, Darwin, and Dovaston all believe the rings to be *formed of their full size at once*, and by a sudden

† See transactions of the Woolhope Naturalists Field Club (for 1868) for these and subsequent notes on this curious subject by Mr. E. Lees, F.L.S., &c.

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act, without which indeed, the idea of dances in the moonlight, made evident when the sun rose, would have been unsustainable.

Shakspere says :—

> "And nightly, meadow fairies, look you, sing,
> Like to the garter's compass, in a ring.
> The expression that it bears, green let it be,
> More fertile fresh than all the field to see."
> —*Merry Wives of Windsor.*

But we must not follow the poets in this matter, but must deal with the facts as we find them. That rings do appear one year where they were not observed before, we have the testimony of our men confirming our own observations. We have also the examples of rings within view of our present study which have not increased in size for the last seven years, as also of many which have never been tenanted by fungi. Still, we have repeatedly seen that whatever tended to kill the grass might be followed by fungi of one sort or another. Thus the spots where grass has been killed by cow droppings will often produce the common mushroom ; places where the turf has been destroyed by dressings of salt, guano, superphosphate, or any highly stimulating manure, will often be afterwards occupied by mushrooms, puffballs, or others of the family ; and that different species so coming may form rings on the centrifugal theory we are not prepared to deny, though we confess to being in possession of but little evidence in support of the theory, and Mr. Lees, as well as previous writers, have confessed to no little difficulty in the matter. Indeed, Mr. Lees has started a notion altogether novel, which, as he looks upon the mole as the author of the so-called Fairy rings, has been dignified as the "molar" theory, of which the description from the paper already cited we now quote in his own words :—

"Now, having paid close attention to these appearances for many years, and not merely looked to the fungus growing in the circle, but to the circle itself, this close observation tells me that in a great majority of cases the original disturbance of the soil in a circular or semicircular form is due to that little mining animal, the mole (*Talpa Europœa*). His gyrations close under the surface of the ground are very remarkable. In making his runs he disturbs the roots of the grass, and the grass itself withers and dies in the round that he has made. This offers a pabulum to the wandering sporules of Fungi not to be neglected, and they seize upon these rounds accordingly, and once there make an occupation of the ground for as long a time as favourable circumstances allow, and then fly off elsewhere. For an uncertain time their occupation increases the size of the ring, but they do not originally form it. The ring is increased too, not by the sporules of the plant scattered about, but by the perennial underground mycelium, which slowly spreads until it is killed by meteorological causes, or like other plants, dies out from exhausted vitality."

This author gives diagrams of mole tracks in support of his theory, but the following objections to his view of the matter appear to us insuperable :—1st. Fairy rings may constantly be seen where the mole has never been noticed, as

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in our own meadows. Secondly, moles, even when they make tracks, do not kill the grasses; but, on the contrary, make such grasses grow more luxuriantly. Thirdly, fresh upturned soil is not favourable to the growth of fungi, but on the contrary these seem to be favoured by the presence of decaying matter, and our May mushroom especially is nourished by the roots of dead and decaying grasses. The quantity of phosphoric acid and potash in both grass and fungus will show that the one is fed on the elements of the other, and the use of phosphatic manures has tended to the growth of the common mushrooms even in our arable fields.

Seeing then that so much has been said and written on the subject of Fairy-rings which is not deemed conclusive as explaining the phenomena connected with them, the question may be asked, is there a better solution at hand or is there anything to add in elucidating what has already been advanced? Now, without presuming to lay claim to the first position, we may yet endeavour to add to observed facts, and we shall, therefore, devote a second part to an account of our own observations and conclusions upon this interesting subject.

PART II.—HOME OBSERVATIONS.

As we have examples of different kinds of Fairy Rings in our home meadow we commence this part with a description of them. In a survey of the Rings of this field, made in 1869, we constructed a chart of more than thirty rings, these being more or less perfect in outline and variable in size. At the present moment, however, we cannot make out more than half of the number of the previous year, but many of these possess a most perfect outline, but the rest appear as though broken up into irregular masses, lines, or patches of green. Six of the most perfect rings in the meadow may be shortly described as follows:—

1. A double ring, 27ft. diameter. The roots of the decaying grasses and the surrounding mould being highly charged with the mycelium of *Agaricus gambosus*, from which, in May of last year, we had several meals of delicious mushrooms.

2. A double ring, 15ft. 6in. diameter. In this, too, the outer ring is charged with mycelium—in this case of the *Ag. oreades*, from which, last September, we enjoyed the "Champignons." From both these we expect crops of fungi this year, though they will be late on account of the backward season.

3. A single ring, 21ft. diameter. This was partially occupied by *Ag. personatus*, three years since.

4. A single ring, 21ft. diameter.

5. The like, 15ft. ditto.

6. The like, 15ft. 6in. ditto.

Of these the three last have not been observed to contain fungi, nor can any mycelium be traced.

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Many rings beyond question increase centrifugally, and the fungus is the cause of the increase. Such rings may be very old as they continue, but there is reason to think that rings to which the fungi have not become attached, soon break up and are lost sight of. In the cases above described the grasses are all of the nutritious kinds, the prevailing one being the *Lolium perenne*, perennial rye grass, and the consequence is that the vigour given to its growth causes a curious appearance when our field is aimed up for hay, as the heavier crop of greener grass makes a complete circle of prostrate herbage. When however it is depastured, the sheep keep the circles so closely cropped that the rings are marked by the fresh green of newly springing grass, and when these animals are first put into a field they fly to the rings, which they eat off before any other part of the field. This observation is so opposed to the idea expressed by Shakespeare, in which he has been followed by our friend Mr. Lees, that we cannot forbear quoting the passage, together with Mr. Lees notes thereupon, in order the more fully to explain this curious and interesting natural history subject. Shakespeare says :—

> You demy-puppets
> That do by moonshine green sour ringlets make
> *Whereof the ewe bites not.*

"Here," says Mr. Lees, "our great bard alludes to the current belief of the time in which he lived, and also mentions a rural fact that we may suppose came under his particular observation. Ewes, he states, will not bite the grass of a fairy ring. Now this is not true with regard to the *area* of the circle, but it is correct when the expression is limited to its *circumference*, which is truly *the ring that the ewe will not bite.* This I once satisfactorily proved, by observation, in the vicinity of Stratford-on-Avon, and probably in a field that Shakespeare had himself trod. In this pasture, through which was a footpath, there was a flock of sheep grazing, and several rings of *Agaricus gambosus.* The exterior circle of each ring was occupied by a tall growth of the coarse grass called *Brachypodium primatum*, among which lay nestled and concealed the savoury agaric. The sheep had close-grazed most of the herbage of the field, but the grass occupying the circumference of the rings was entirely untouched. It was then, doubtless, the *vernal* fairy rings to which the immortal bard alluded." *(E Lees, the Woolhope Club*, 1868.*)*

Now it is quite clear that in this case the peculiarly innutritious kind of grass was the real reason of its being refused by the sheep, as observed by the poet, and afterwards by the naturalist; but when such favourite kinds as the *Lolium*, in our home circles, and this and the *Dactylis glomerata*, as observed at the Agricultural College meadow, is improved by phosphatic manure, whether that be purposely employed or is derived from decaying fungi, these grasses become more succulent, and are consequently relished by sheep.

But we have stated that many of our rings are without fungi; still, whether with or without these, we look upon it as a fact that the initiative

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of the circles as not necessarily connected with these plants, and this leads us to the inquiry,

HOW ARE FAIRY RINGS FORMED?

Now it appears to us that anything which may tend to kill a given area of grass may be the beginning of a Fairy ring.

Some years since we were asked to examine a meadow in which the grass was said to be killed in circular patches, as we were told "the rooks had taken a fancy to it and were eating it all out." On going to the field we observed several areas of variable size in which the tops of the grass were turned upside down, as if for the purpose of being dried. On removing some of these and turning away the soil, we were not at all surprised to see hundreds of the larvæ of the Cock-chaffer *(Melolontha vulgaris)*. These the rooks were doing all they could to exterminate. After this a friend at a distance who was suffering from a like attack in his meadow was desirous of keeping the rooks from being disturbed. But our object in this description is not to defend the rook, but to point out the origin of Fairy-rings. Immediately, then, after the destruction of these discoid patches of herbage, the herbage all round the outer margin of the denuded space assumed a ring-like belt of a more robust grass than that of the rest of the field, and for the same reason that at the present moment a row of barley next to our farm path is taller and stronger than the row next to it, the fact being that in both cases the roots have no growth on one side to interfere with their full development. In our own meadow we have at the present time some denuded patches of grass caused by the leaving of separate lots of hay on the ground. This killed the herbage beneath, and now the ring of strong and taller grass, mostly of *Lolium perenne*, is fully established.

Now the very vigour of growth of the rings of grass so established causes a secondary or outer ring, because this very plethora of an inner ring aids in the pauperism of the grasses next to them, and as starved grasses soon decay and die, we have in this secondary ring the very conditions necessary to the growth of fungi. Suppose fungi to have so started their decay from the very chemical elements they contain, necessitates a vigorous growth of grass on their site, and besides the ground having rested for a season from growing grass, would grow it all the more vigorously the next, with the same result to the grass beyond, and thus it is that these processes, continuing a ring gets larger.

That rich grass is at once formed where the *Ag. gambosus* is left, we have Mr. Way's testimony as well as our own observations in proof. He says:—"An experiment was made of spreading some fungi on the grass of the pasture when the rings occur; the letters in the form of which the fungi were arranged were clearly visible a month afterwards. We have tried the like experiments with the same effects. It would seem, then, that these curious circles may be caused by anything that may tend to destroy a disc of grass, but their occupancy by fungi is dependant on after circumstances. If so occupied

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they continue year after year and increase, but if not, like many in our own meadow, they become broken up and ultimately destroyed. Again, a good dressing of manure over a field in which they occur tends to the breaking up of the rings. That Fairy rings follow the injury to grasses by the attacks of insect larvæ and by the death of a disc of grass by rotting material left on it for a winter we have ample evidence before us, and there is reason to believe that a too heavy dressing of stimulating manure by killing the grass would produce a like result. Salt again by killing the grasses is known to be succeeded by fungi, which, as we have shown, live upon the decaying elements of the grass roots. It is then just possible that rings may occasionally follow some unexplained atmospheric cause, as the Dorset poet says:

—— Zome
Do zay do come by lightnĕn when do thunder.

This is the atmospheric theory. The same author gives the fairy theory in the following words:

Zeme do zay sich rings as thick ring there is
Do grow in dancĕn-tracks of little veăries,
That in the nights o' summer and o' spring
Do come by moonlight, when noo other veet
Do tread the dewy grass but theirs, an' meet
An' dance away together in a ring,
—*Barnes's Poems on Rural Life, in the Dorset Dialect.*

It is a curious fact that the Dorsetshire peasant of our day gives the name of *veărie* to the stoat and weasel, which suggests the possibility that these quadrupeds might have been observed by them roaming about the sites of fairy-rings in search of larvæ, by which the area of the circle is first formed. At all events our labourers believe that their veăries have some connection with the rings. This suggests the probability that the mole tracks observed about fairy-rings by Mr. Lees are caused by these voracious creatures visiting the bare patches made by the Melolontha, and burying beneath the soil in search of them. Our observations, then, lead us to conclude that Fairy-rings are not usually caused by fungi, though these may take possession of a ring formed by other means. Nor do we suppose with Aubrey that the rings are produced by "a fertile subterraneous vapour which comes from a kinde of conical concave." We cannot agree with the mole theory, for the reason that moles do not kill grasses, but, on the contrary, make a field more fertile; and although our landlord makes us pay a mole-rate for the destruction of these creatures on his estate, we have never seen any sign of one on our farm, and if we had a choice in the matter, such is our love of these creatures and such our conviction of the good they do, that we had rather pay a rate for their preservation. Were they preserved on our farm we think it impossible that we should meet with over 800 surface grubs in three rows of roots, and equally impossible would it be to meet with bald rounded patches in our meadows from which to extract *over* 30 *fat larvæ of the Cockchaffer in the space of a square foot.*

We think then that the primary cause of fairy rings is the destruction of circular patches of grass and not the construction of rings, in the first instance

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either by moles or electricity, and that these rings are subsequently occupied by fungi results from these lower plants called by Linnæus the "Scavengers of Nature" living upon the decaying elements of higher kinds of vegetation.

We conclude then that we can make fairy rings at pleasure, and as we are now carrying out some experiments on the subject it will be well just to indicate their nature..

We sow a disc of salt thickly strewn on turf—it kills the greater part of the grass from the rings so formed we expect the whole phenomena before described whether fungi will succeed we cannot say, but they may. One thing is quite certain that where salt has been employed on pastures mushrooms are usually abundant, but this upon the same principle that summers of drought if followed by warm moist autumns are sure to be productive of good crops of Agarics. This season the rains of September promised a fine supply of mushrooms in October but the latter month having been unusually dry we fear the fungologist will meet with but a scanty supply during the present foray. Still whether they are, or are not abundant, the facts of the case can be observed and noted, and as all observations are useful I may be excused for those I have now offered (applause).

Mrs. Key, of Stretton, had also sent a short paper on Fairy-rings, taking a similar view to that of Professor Buckman, viz., that the Funguses seized upon the rings for the provender they found there, instead of forming the rings themselves.

A warm discussion followed the able paper read, in which Mr. Edwin Lees, Mr. Harrison, Dr. Bull, and some other gentlemen took part. Whilst combatting the views brought forward it certainly tended to show that the true solution of the problem was by no means easy. One practical observation was generally agreed to, and that was that after the present hot and dry summer, Fairy-rings had been very abundant, and the ordinary field mushroom, *Ag. campestris*, which usually grows in scattered clusters, had been observed growing very commonly in crowded rings.

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ON THE LARGER FUNGI OF TREES.

BY WORTHINGTON G. SMITH, Esq., F.L.S.

The Fungi which grow upon trees are perhaps the most unfortunate of their tribe, since they not only fail with the rest in securing a proper appreciation from the world in general, but are, at the same time, most unfairly treated. Their very parasitic nature offers a temptation to the superficial observer, who would "point a moral, or adorn a tale," that is almost irresistible. The series of analogies they seem to present may be followed up with so much closeness, and with such precision, as almost to conceal their unreality; and it will be well, therefore, to present a few of them; for if poets may claim a license, certainly for moralists a false foundation is fatal.

Tree Fungi may be represented as parasites of the most vile and contemptible order, ever ready to prey on the great and on the good.

A parasitic fungus may be held up as a warning against the encouragement of an unworthy associate—or the insertion of the small end of the wedge—for the microscopic spore once admitted will quickly spread destruction, however grand the tree may be.

Are they not evil genii it is impossible to shake off, and which inevitably lead on to destruction the trees they haunt? Again, they may be likened to vampires: the spores flit about and fasten themselves, alike on the living and on the dead, sit fixedly on their victims day and night, fatten on their juices, and drink their heart's blood to the death.

A fine "vegetable beef-steak" at the foot of an oak, like the beautiful Vivien at the feet of Merlin, may be made to represent the destruction of the great and glorious by the trifling and worthless.

An oak tree in Mycology, afflicted with a Fistulina, may be compared with Prometheus and the vulture in Mythology. It is seldom, however, that a Hercules appears in a fungological form to free the tree from its visitor.

The tree fungus, in another picture, is again the false guest that destroys its host. If the heart of the tree is sound, and its bark hardened against the insinuating ways of a spore, then all is well; but if it presents a soft place, the spore will find it, get a footing, and all is over with the landlord. The lodger, so minute, and apparently so innocent and helpless, rapidly swells out, and becomes a troublesome and impudent tenant. He sends his mycelium from the garret to the basement, and sticks out its pileus from the side of the tree like a public-house sign. Never will he leave his lodgings till the landlord

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is dead. The tree, however, has a forlorn hope (seldom gratified) that some passing fungologist may for the time being play the part of a bailiff's officer, and present a writ of ejectment in the shape of a powerful knife. When this does occur to the "vegetable beef-steak," there's a moral in the terrible fate of the lodger, for the fungus will certainly undergo vivisection and pass through the fiery ordeal of the frying-pan.

In all these pictures the spore, and the fungus it produces, is made the type of treachery and deceit, the active agent of silent but inevitable destruction; but this is not true to nature. The spore does not cause the decay of the tree; it simply grows upon the disease and decay it finds there. The fungus protruding from the bark is indeed often the very first sign of anything being wrong with the tree, but it tells the thoughtful owner of the existence of decay there as plainly as possible. He must cut down the tree at once if he would save his timber, or if the tree's life is an object, he must seek out the cause of its partial decay and quickly remove it.

Thus from this Life on Decay and Death, in all its varied forms of interest and beauty, the poet and the moralist might draw brighter and more hopeful lessons, and their greater truthfulness to nature would lend a force to the picture and a soundness to the moral which they cannot otherwise possess.

It is not the object of this paper, however, to enter into the subject of the uses and merits of Fungi, nor to discuss the part played in nature by this form of vegetable life, but simply to point out the several species that inhabit trees.

The parasitic fungi of forest trees are very numerous; the varieties are of every shape, and size, and quality: amongst them figure the largest as well as the most minute, and the hardest as well as the softest of all known fungi. Some are often so large as to resemble a table both in size and substance, whilst others are so small as to require the microscope to detect their presence. When once established, whether large or small, they live at the expense of the tree on which they grow, and indeed sometimes hasten its decay. Some large ones distil the sap in drops from the tree, as *Polyporus dryadeus*, Fr., common on the oak, and *Polyporus hispidus*, Fr., common on the ash. The minute fungi for the most part are content to prey upon the leaves, the small twigs, or even the fallen and half decayed leaves of the previous year.

All these parasitic fungi originate from spores beyond a doubt, and that they should always be ready to appear under circumstances which favour the growth, will not be so much wondered at, when the infinite multitude of spores which is produced from a single fungus is taken into consideration. These minute reproductive bodies, invisible to the naked eye, as separately they are, will yet by their aggregate incomprehensible numbers, form a thick dust beneath a single *Polyporus*. As these spores are set free when ripe, they are carried in every direction by the wind. Such few as may alight on the decayed spot of a tree, or other suitable nidus immediately germinate, and all others are lost.

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It is not to be expected that a botanist can go about the woods, microscope in hand, peering with it into the minute nooks and crannies of trees to see if there are any fungus spores germinating, but the process can easily be observed by artificial means. The spores are so infinitely small they can only be examined as transparent objects, and the easiest mode of seeing their germination is to allow a few ripe spores to drop from a recently gathered and *living* fungus, on to a small glass slide; if this slide be at once put under the microscope, and the spores kept warm and moist, they will germinate within twenty-four hours. As glass does not afford them nourishment, the spores cannot of necessity go on growing, but must perish after they have thrown out a few mycelial filaments. One of the best and commonest fungi to experiment with in this way is *Panus stypticus*, Fr. The spores of this species generally germinate in an hour or two. After leaving the living parent, repeated breathing upon the glass slide greatly aids germination.

Again, if living spores are allowed to fall upon damp blotting paper, and the paper is kept moist and warm, the spores will readily germinate; to see them, the blotting paper must be gently touched upon moist glass; some of the germinating spores will then be transferred from the paper to the glass, and can be seen as transparent objects. Dark spores, especially the black, are the quickest to germinate; light spores, especially the white, are the slowest. From my observations, I believe spores to be exceedingly short-lived; some do not live a single hour: the persistency and endurance resides in the mycelium. I believe that most spores die very rapidly, after leaving the hymenium of the parent, for this reason, that when I have allowed them to fall upon dry glass and they have been exposed to dry air for a few hours, no efforts on my part to revive them and cause them to germinate have been at all successful.

When fungus spores have once alighted upon a suitable nidus, and thrown out the mycelial threads, their destruction is by no means easy; this mycelium is neither destroyed by the heat and drought of summer, nor by the soddening rains and frosts of winter; it often exists under ground, or in trees, for years without reproducing the parent fungus, owing to unfavourable combinations of atmospheric and other circumstances. It is, however, very seldom utterly destroyed, a well-known case in point being the almost insuperable difficulty of destroying the mycelium of dry-rot (*Merulius lacrymans*, Fr.) in timber.

In giving a list of the larger Fungi peculiar to trees, two classes at once present themselves to our notice: the first consisting of such as are altogether peculiar to, and never found off certain trees; the second being a cosmopolitan group, more or less liable to affect all sorts of trees. A good example of the first is *Dædalea quercina*, P., never found elsewhere than on the Oak, and an equally good example of the latter is *Agaricus velutipes*, Curt., which may be found growing upon every sort of stump and tree. There is, indeed, a third class of epixylous Fungi, the species of which are almost confined to certain trees, but on rare occasions are found on various other stems. An example of this class

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is met with in *Fistulina hepatica, Fr.*, which is generally found on old Oaks; it is, however, somewhat common on Beech in Epping Forest, and I have gathered it in fine condition from the Ash. It has also been met with on the Walnut and Chestnut.

Sometimes the special habitat of Fungi found on trees is the principal character. This is the case in *Radulum quercinum*, Fr., and *Radulum fagineum*, Fr., one plant differs very slightly from the other in specific characters, but one is peculiar to the Oak, and the other to the Beech.

In the following list it will be understood that the enumeration of Fungi peculiar to certain trees, includes also the stumps and branches of the same tree, as well as old rails, and squared timber made from it.

It must not, however, be supposed that because *Marasmius epiphyllus*, Fr., for example is given under "Ash petioles," that the species is *never* found elsewhere, but that it is its *usual* and *common* habitat. The same remark applies to many other species which are *almost* peculiar to certain trees. All the species here given are Hymenomycetous, except two truffles.

A few species, from their peculiar habits, should find a place in this list, as the Fungi generally found on walls and ceilings, as *Agaricus muralis*, Sow., *Coprinus radians*, Fr., *Tulostoma mammosum*, Fr., *Peziza domestica*, Sow., and *P. Piggotii*, B. and Br. On sawdust, as *Agaricus petasites*, Fr., *A. cucumis*, P., *Paxillus Panuoides*, Fr., *Sphærobolus stellatus*, Tode, &c. On chips, as *Agaricus furfuraceus*, P.; and many others. On chestnut husks, as *Peziza echinophilia*, Bull.; and on fallen catkins, as *Peziza caucus*, Reb.

The names of the microscopic Fungi affecting the leaves and twigs of trees and the long list of species found on old stumps and rotten branches in general are omitted from the appended list, for the reason that they would teach nothing and be of no help in the determinations of species.

For further particulars as to the several Fungi, recourse must be had to Berkeley's "Outlines," or the more recently published "Handbook" of Mr. Cooke's.

LIST OF FUNGI.

ON CONIFERÆ; PRINCIPALLY ON SCOTCH FIR.

Ag. (Tricholama) rutilans, Schæff.
,, (Pleurotus) mitis, P.
,, ,, Hobsoni, Berk.
,, ,, porrigens, P.
,, ,, striatulus, Fr.
,, (Mycena) Iris, Berk.
,, (Pholiota) marginatus, Batsch.
,, (Flammula) scambus, Fr.
Ag. (Flammula) flavidus, Schæff.
,, ,, inopus, Fr.
,, ,, hybridus, Fr.
,, ,, picreus, Fr.
Paxillus atro-tomentosus, Fr.
Lentinus lepidius, Fr.
Lenzites sepiaria, Fr.
,, abietina, Fr.

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ON CONIFERÆ—*(Continued).*

Polyporus fragilis, Fr.
,, destructor, Fr.
,, annosus, Fr.
,, abietinus, Fr.
,, Armeniacus, Berk.
,, incarnatus, Fr.
,, cinctus, Berk.
,, Gordoniensis, B. and Br.
Trametes pini, Fr.
Merulius pallens, Berk.
Porothelium Friesii, Mont.
Hydnum gelatinosum, Scop.
,, coralloides, Scop.
Irpex pendulus, Fr.
,, fusco-violaceus, Fr.
Thelephora arida, Fr.
,, olivacea, Fr.
Stereum sanguinolentum, Fr.
Corticium giganteum, Fr.
,, caloeum, Fr.
,, ochraceum, Fr.
Calocera viscosa, Fr.
Exidia saccharina, Fr.
Naematelia encephala, Fr.
Dacryomyces deliquescens, Duby.
— stillatus, Wees.
— chrysocomus, Tul.
Hymenula punctiformis, B. and Br.
Ditiola radicata, Fr.

ON FIR CONES.

Ag. (Collybia) conigenus, P.
,, ,, tenacellus, P.
,, (Mycena) strobilinus, S.
,, ,, tenerrimus, B.
Marasmius caulicinalis, Fr.
Hydnum auriscalpium, L. Under Firs
Melanogaster ambiguus, Tul.

ON OAK.

Agaricus (Collybia) exsculptus, Fr.
Polyporus quercinus, Fr.
,, dryadeus, Fr.
Dædalia quercina, P.
Merulius rufus, P.
Fistulina hepatica, Fr.
Radulum quercinum, Fr.
Stereum spadiceum, Fr.
Corticium quercinum, Fr.
Calocera cornea, Fr.
,, glossoides, Fr.
Tremella frondosa, Fr.
,, torta, Willd.
Exidia glandulosa, Fr.
Hydnum erinaceus, Bull.
Apyrenium armeniacum, B. & Br.

ON BEECH.

Agaricus (Armillaria) mucidus, Fr.
,, (Mycena) chelidonius, Fr.
,, (Pholiota) adiposus, Fr.
,, (Pleurotus) spongiosus, Lasch.
Trogia crispa, Fr.
Polyporus cuticularis, Fr.
Polyporus cervinus, P.
Merulius aurantiacus, Klotsch.
Hydnum coralloides, Scop.
,, squalinum, Fr.
,, erinaceus, Bull.
Radulum fagineum, Fr.
Irpex Johnstoni, Berk.
Solenia candida, Hoffm.

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UNDER BEECHES.

Cortinarius (Phlegmacium) prasinus, Fr.
,, (Dermocybe) raphanoides, Fr.
Cortinarius (Telamonia) periscelis, Weinm.
Melanogaster variegatus, Tul.

ON BEECH MAST.

Agaricus (Myoena) balaninus, P.
Cortinarius (Hygrocybe) Reedii, Berk.

ON ASH.

Agaricus (Pholiota) adiposus, Fr.
Lentinus tigrinus, Fr.
,, Dunalii, Fr.
Polyporus squamosus, Fr.
,, fraxineus, Fr.
Hydnum coralloides, Scop.
Stereum spadiceum, Fr.
Calocera striata, Fr.
Dacrymyces sebaceus, B. and Br.

ON ASH PETIOLES.

Marasmius epiphyllus, Fr.

ON TWIGS.

Corticium confluens, Fr.

ON ELM.

Agaricus (Pleurotus) ulmarius, Bull.
,, subpalmatus, Fr.
,, striatus, Jacq.
,, (Naucoria) horizontalis, Bull.
,, (Claudopus) euosmus, Berk.
Marasmius spodoleucus, B. and Br.
Polyporus ulmarius, Fr.
,, epileucus, Fr.
Tremella moriformis, Berk.
Hirneola auricula-Judae, Berk. (this also occurs commonly on the elder).

ON WILLOW.

Agaricus (Pleurotus) salignus, Hoffm.
,, (Naucoria) erinaceus, Fr.
Polyporus salignus, Fr.
,, ignarius, Fr.
,, salicinus, Fr.
,, purpureus, Fr.
Trametes suaveolens, Fr.
,, odora, Fr.
Dædalea confragosa, P. (also on Wild Service, &c.).
Corticium lactescens, Berk.
Tremella indecorata, Somm.
Exidia recisa, Fr.

ON BIRCH.

Trogia crispa, Fr.
Polyporus betulinus, Fr.
Polyporus nigricans, Fr.
Radulum orbiculare, Fr.

UNDER BIRCH.

Agaricus (Amanita) muscarius, L.

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ON LIME.

Polyporus vegetus, Fr.
Agaricus (Pholiota) marginatus, Batsch.
Agaricus (Flammula) flavidus Schæff.

ON ALDER.

Agaricus (Leptonia) euchrous, P.

ON HAZEL.

Polyporus radiatus, Fr.
Stereum rugosum, Fr.

ON PRIVET.

Polyporus Stephensii, Fr.

ON BRAMBLE.

Agaricus (Mycena) roridus, Fr.
" " cohærens, A. & S.
Cyphella ochroleuca, B. and Br.

ON CURRANT AND GOOSEBERRY.

Polyporus Ribis, Fr.

ON MAPLE.

Stereum acerinum, Fr.
Dacrymyces sebaceus, B. and Br.

ON SYCAMORE.

Thelephora anthochroa, P

ON LABURNUM.

Agaricus (Pleurotus) ostreatus, Jacq.
Polyporus cytisinus, Berk.

ON PLUM.

Polyporus igniarius, Fr.

ON APPLE.

Polyporus connatus, Fr.

ON PEAR.

Dacrymyces violaceus, Fr.

ON POPLAR.

Polyporus igniarius, Fr.
Stereum purpureum, Fr.
Corticium roseum, P.
Corticium polygonium, P.

ON WILD SERVICE.

Agaricus (Crepidotus) chimonophilus, B and Br.
Daedalea confragosa, P.

ON ELDER.

Agaricus (Pholiota) pudicus, Bull.
Corticium Sambuci, P.
Hirneola auricula-Judæ, Berk.

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ON FURZE.

Polyporus lentus, Berk. | Naematelia virescens, Corda.

ON YEW.

Polyporus sulfureus, Fr.

ON CHERRY.

Corticium evolvens, Fr.

ON JUNIPER.

Gymnosporangium Juniperi, Lk. | Podisoma folücolum, B.
Podisoma Juniperi-communis, Fr.

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ILLUSTRATIONS OF THE EDIBLE FUNGUSES OF HEREFORDSHIRE.

BY DR. BULL.

(Continued from the Volumes of the Transactions for the years 1867-8 *and* 9, *and concluded).*

"Beneath the open sky She (Nature) spreads the feast,
'Tis free to all: 'tis every day renewed:
Who scorns it, starves deservedly at home."
COWPER.—The Task I.

The present year has again been most unfortunate for the production of Funguses. The want of moisture has quite prevented their appearance in their usual abundance. Hitherto the driest year on record for this part of England was the year 1864, but the present year has been still more dry. The following table shows the amount of Rainfall during the months of June, July, August, and September this year, as compared with that for the two last years, and for 1864 :—

	1864. Inches.	1868. Inches.	1869. Inches.	1870. Inches.
June	1·091	0·435	0·947	0·220
July	0·381	1·231	0·400	1·194
Aug.	0·701	5·187	0·843	1·048
Sept.	3·466	3·526	5·920	1·407
Total ...	5·639	10·399	8·110	3·869

The total for the first nine months of the year in 1864 was only 13·140 inches, but this year the total for the period has been so low as 10·869 inches.

Though the weather was thus so dry in England, we know that during the two last of these months—August and September—great quantities of rain fell on some parts of the Continent. The field operations of the great armies of France and Prussia, in Alsace and Lorraine, were greatly inconvenienced by it at this time, and the fact is mentioned here for the clear inference that the continued rain must also have produced a great abundance of the Edible Funguses, which are so well known and so much esteemed by the peasantry. *Boletus edulis*, described and figured in this paper, *Agaricus procerus*, *Lactarius deliciosus*, *Marasmius oreades*, and many others, form a large and important item in the food of the people of those provinces during the autumnal months. The territory is notably celebrated for one fungus of great size, *Polyporus intybaceus*. "The ancient forest districts of the Vosges and Ardennes," says Mr. Hussey,

[NOTE: The Rainfall for the whole year in 1864 was 19·32 inches, that for this year—1870—18·731, and the general average Rainfall is about 27 inches.]

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"produce abundantly this peculiar and beautiful fungus. There the grey 'cock of the woods' still crows in undisturbed regality and from the resemblance *Polyporus intybaceus*, seated among the grass at the foot of the tree, bears to his wife, the grey hen, while she is brooding over their progeny, it is not unaptly called 'La poule qui couve.' The colour of the pileus is a sober grey brown, relieved with zones of a deeper shade, whilst the under surface is snowy white, like the bird's down when she angrily elevates her feathers." This plant is rare in England, but in those districts "no Fungus is more highly esteemed as an article of diet." Unlike most Funguses it is not the top that is eaten, but the large solid white stems. These, moreover, may be dried and thus preserved for a considerable time. They are gently stewed down to render them soft, and served in a variety of ways.

To those who understand the rich nourishing food which Edible Funguses afford, it is a consolation to know that is has been very abundant this autumn in Alsace and Lorraine. The constant presence of such large armies there must necessarily produce a famine, so far as ordinary articles of food are concerned, but they could not take from the poor peasantry that "manna of the poor," the Funguses, "free to all, and every day renewed," which must indeed this year have proved an inestimable blessing to them.

Notwithstanding the unfavourable season for Funguses this year, the zeal shewn in their study has considerably increased. Several species, new to this country, have been found here; and the crowds that filled the large room of the Horticultural Society at Kensington in October, to see the Exhibition of Funguses, sufficiently testified to the increasing interest taken in them by the public generally.

The event, however, which marks most prominently the Mycological progress of the year, is the publication of the first and chief part (pp. 376) of the "HANDBOOK OF BRITISH FUNGI," by Mr. M. C. Cooke, "with full descriptions of all the Species, and Illustrations of the Genera." This book will render great service to the student in this difficult branch of Mycology, following, as it does, so closely the excellent descriptions of Fries and of Berkeley. It yet adds fuller details, which are as necessary, as they will prove to be most useful to the inde-

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[NOTE:—The mushrooms cultivated in some parts of the catacombs of Paris have proved of great service during the seige. A letter written on Christmas-eve by a lady who, with her family, was shut up in Paris (published in the London *Times*, of January 13th), gives a touching picture of the straits to which families with ample means were reduced. "The food was daily shrinking from every one." It was long since she had tasted animal food, since she could not "avail herself of the loathsome substitutes which are now quite common." Potatoes had long disappeared, and it was an event when the servants found one day five or six small ones in the bottom of a closet." "The servants might have had chocolate, but preferred bread-soup with wine, and eat mangold-wurtsel as salad." Then after exact details of her own meagre fare, she says "For dinner we have sometimes a weak vegetable broth; sometimes, as to-day, we have a wonderful find—peasoup: sometimes tapioca *bouillon; then occasionally a dish of mushrooms, and these fungi have served us in good stead; they make quite a meal well stewed.*" The thermometer was at this time was 12 degrees below zero, and the mushrooms could only have been produced in small quantities."]

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pendent student of Nature. The illustrations, too, are excellent, and very numerous. That the book was much called for is proved by the long list of subscribers for it, and that Mr. Cooke has spared no effort to render it as complete as possible, must be admitted by them all. Thus far, contrary to custom, he has more than borne out the promises of his prospectus, and has really given to subscribers the advantages held forth.

One other publication of the year, "MUSHROOM CULTURE," by Mr. W. Robinson, F.L.S., requires a brief notice. In cover, in type, and in illustration, this book is well got up to float on the rising tide of fungus favour. There is a sad want of originality about it, and those who know the Woolhope Transactions, will recognise many of its pages. To others much will seem to be original which is not so, for the proper acknowledgment is frequently forgotten.

The Edible Funguses selected for Illustration in this paper are the Edible Tube-Mushroom, *Boletus edulis;* Ivory Cups, *Hygrophorus virgineus*; the Pasture Hygrophorus, *Hygrophorus pratensis;* and the Giant Puff-ball, *Lycoperdon giganteum*; and with these the series will be concluded.

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FAMILY I.—HYMENOMYCETES.

ORDER II.—POLYPOREI.

Hymenium lining the cavity of tubes or pores, which are sometimes broken up into teeth, or concentric plates.

GENUS: BOLETUS.

Hymenophorum quite distinct from the Hymenium. Trama obsolete. Hymenium lining the cavity of tubes separable from one another and from the Hymenophorum.

BOLETUS EDULIS.—*Bulliard.*

EDIBLE TUBE-MUSHROOM.

BOTANICAL CHARACTERS.

Pileus: Smooth, pulvinate, from five to seven inches across; usually of a light-brown or bay colour. *Flesh*: white, and unchanging when broken or cut.

Stem: Thick and solid, often irregular in shape; without any ring; white changing to fawn colour; finely and beautifully reticulated towards the upper part; and inserted into the pileus through a deep depression of the tubular surface.

Tubes: Minute, elongated, half-free, at first when young, white in colour, then yellow, becoming eventually of a yellow-green, or olive colour. *Spores*: olive green.

There is perhaps no other edible Fungus more frequently sought for, and more frequently mistaken, than the Edible Tube-mushroom, yet when once known it can never again be mistaken. Its *whitish delicate fawn colour when young*; its *large size when full grown*; its *smooth skin*; its *white flesh, unchanging when injured*; the *colour of its tube-surface varying with its age*; the *very fine net-work on the upper part of the stem*; and its *agreeable flavour*, are characters which combined together clearly distinguish it from every other Boletus; and there is no doubt but that any Boletus, at all approaching this description is wholesome.

It is in the greatest perfection for eating when the pore-surface is yellow; but when the texture is soft and flabby from any cause, it should never be used for the table.

The illustration given has been reduced one-third in size, to suit the page, and the presence of Reichenbach's violet at its foot shows that after wet weather the fungus may be looked for even in early summer. The specimen

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Boletus edulis. Edible Tube Mushroom.

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Boletus edulis. Edible Tube Mushroom.

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from which the drawing was made, too, was unusually symmetrical. No species of Fungus grows more irregularly, often contorted and twisted, bulging out unduly in one place, and puckered up in another. It varies, too, considerably in colour, from the lightest fawn to a deep chestnut or reddish brown colour; but, as has been happily said, when once known it is never mistaken, for however unlike itself it may sometimes grow, it is always much more unlike anything else.

There are two clear general rules with reference to this tribe of Funguses, and the first is to reject every Boletus as dangerous if a blue tinge passes over the surface of the flesh when it is cut or broken; and secondly, to reject them also if the tube-surface is red or scarlet; and thus the really dangerous kinds—some of them very common—are at once set aside. It must be added, nevertheless, that the greatest Italian authority, Vittadini, is of opinion that no Boletus is really unsafe, if dried. "Slips of dried Boletus" he says, "sold on strings, are as frequently cut from *Boletus luridus* and *Boletus cyanescens* as from *Boletus edulis* itself; notwithstanding which, no accident was ever known to happen from the indiscriminate use of either." "Before I properly knew *Boletus edulis*," says Mr. Worthington G. Smith, "I ate all sorts of Boleti in mistake for it, notably *Boletus chrysenteron*." (Mushrooms and Toadstools, p. 23.)

Still, the rule holds good. Reject without hesitation all that are red or scarlet on the tube-surface beneath, and all that turn in the least blue on being cut, for certainly several that do so are dangerous in their fresh condition, even though they may be rendered safe by drying.

Boletus edulis is one of the earliest Funguses to appear, and in favourable seasons may be found at any time during the summer months, or in early autumn. It cannot be said to be very common in Herefordshire. It is widely scattered through the county, but grows usually in small quantities. Some seasons, however, it is very abundant in places, and on Dinedor Hill Common under the oak trees, beneath the beech trees at Whitfield, and probably in many other places, a wheelbarrow full at a time may be gathered. At Haywood Forest, The Mynde Park, Bryngwyn, Dinmore, Bredwardine, and in many other scattered localities, specimens are annually to be found in more or less abundance. When found it should be gathered, for it seems here to be a delicate fungus, liable to be quickly affected by mildew, without any cause easily to be assigned for it.

It is readily dried when cut into pieces, and is "adapted," says Vittadini, "above every other fungus for commerce. It forms in not a few provinces in Lombardy one of the principal resources of the poor people."

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OPINIONS ON THE MERITS OF BOLETUS EDULIS AS AN EDIBLE FUNGUS.

All modern gastronomists unite in pronouncing this Fungus "excellent and delicious." It is held in general esteem on the continent of Europe, Throughout middle and southern France, under the names of *cep*, *gyrole*, *brugalt*, or *potiron*, it is generally eaten, and is in particular request about Bordeaux, Bayonne, and in the Lorraine, where it is called the Polish mushroom. In the Department of the Gironde great quantities of it are dried and sent to the Paris market. Under the name of *Porcius* it is sold in every market of modern Italy, and in Rome is is to be met with at every street corner, in company with figs, peaches, and the orange agaric.

"Cette espèce est Européene, et toutes variétés sont délicieuses. La pulpe en est fine, délicate, d'un parfum agréable, d'une blancheur permanente, sourtout dans les jeunes individus, qu 'on doit toujours préférer."—*Roques.*

"A most valuable article of food. It resembles much in taste the common mushroom, and is quite as delicate; it abounds in seasons when these are not to be found."—*Berkeley.*

"In every way it is good. Its tender and juicy flesh, its delicate and sapid flavour, render it equally acceptable to the plain and to the accomplished cook. It imparts a relish alike to the homely hash and the dainty ragoût, and it may be truly said to improve every dish of which it is a constituent, 'Nihil tetiget quod non ornavit.'"—*Badham.*

"Our own knowledge and that of gentlemen of our acquaintance, who are much greater amateurs of fungi, hold to the opinion of Dr. Badham."—*M. C. Cook.*

"When small, hard, and compact, from growing in a dry and poor situation, they are worthless; when flabby, from being surcharged with moisture or from age, they are when cooked insipid, soft, and by no means good: but between these conditions, when their tubes present a delicate pale yellow surface, and the fine reticulations of the stem are slightly fawn-coloured, a large free-grown firm Boletus, is super-excellent amongst esculent funguses."—*Mrs. Hussey.*

"An excellent vehicle for the employment of highly flavoured sauces and good cookery."—*Miss M. R.*

"One of our commonest and most delicious species."—*Worthington G. Smith.*

"*Boletus edulis* is mild and pleasant in flavour, and of great digestibility. It is very different to the generality of Agarics, and affords a great contrast to their stronger flavour and tougher structure."—*Edwin Lees.*

MODES OF COOKING BOLETUS EDULIS.

In Russia, during the fasts of the Greek Church, the dried *Boletus edulis* is simply boiled and eaten with the usual condiments. Our own poor, if they would but fry thin slices of *Boletus edulis* with their bacon, would find in it not only a great luxury, but a great increase of nourishing food free of all cost.

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There are many elaborate ways of cooking the Tube Mushroom :—

"It may be cooked in white sauce, with or without chicken in fricasee, broiled or baked with butter, salad oil, pepper, salt, chopped herbs and bread crumbs, to which some add ham, or a mince of anchovy. It makes excellent fritters. Some roast it with onions (basting with butter), but as the onions take longer to cook they must be put down first, and when they have begun to soften the *Boletus* may be added."—*Persoon.*

"Scoop out the tubes with a silver spoon, then cut the remainder in pieces; lay them in a dish with butter, pepper, and salt; cover the dish close, and bake for one hour"—*Miss Plues.*

"Whether boiled, stewed, fried, or roasted, this species will prove itself one of the most delicious and tender objects of food ever submitted to the operation of cooking."—*Worthington G. Smith.*

"It should not be disguised with any sauce beyond lemon-juice and powdered lump sugar; in fact, as part of a fungus dinner, it should come last with the puddings and sweets. As a fricasee or sweet omelette it is excellent, and when thus delicately cooked, it has a close resemblance to custard pudding."—*Edwin Lees.*

29. Boletus Edulis Soup, made in Hungary.

"Having dried some Boletuses in an oven, soak them in tepid water, thickening with toasted bread till the whole be of the consistence of a purée, then rub through a sieve; throw in some Boletuses, boil together, and serve with the usual condiments."—*Paulet.*

30. Boletus Edulis a l'Andalouse.

Remove the stems and pores from the funguses, and divide the remainder into half-inch slices. Take 6 or 8 ozs. of lean uncooked ham, cut into small squares, and put them into a large stewpan, adding a large wineglass of the best salad oil, and fry for a few minutes, until the ham takes a pale yellowish colour, then add the pieces of Boletus, and fry for another five minutes; remove from the fire, and add a tea-spoonful of common salt, a salt-spoonful of crushed (not ground) black pepper, one large sweet Spanish red pepper (Pimento) cut in pieces, a little nutmeg, and a teaspoonful of chopped parsley; add a large wineglassful of sherry. Then place it on the fire, the lid of the stewpan closely shut down, and let it stew gently for three-quarters of an hour; stir in the juice of half a lemon, and serve up hot.

N.B. The pimento has a warm aromatic flavour, but is not hot to the taste. If it cannot be procured; a fresh green chili may be substituted, or the dish will still be excellent if the judicious cook will slightly increase the quantities of the other condiments.

The Edible Tube Mushroom may be cut into slices and dried very readily, as is so commonly done on the Continent. It should then be kept in thin muslin bags, and when required for use should be previously soaked for a few hours in water.

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FAMILY I.—HYMENOMYCETES.

ORDER I.—AGARICINI.

GENUS VII.—HYGROPHORUS.

Hymenophorum continuous with the stem, and descending without change into the sharp-edged gills; hymenium waxy,

SECT II.—CAMAROPHYLLUS.

Veil none; pileus fleshy, moist, scarcely viscid.

HYGROPHORUS VIRGINEUS.—*Fries.*

IVORY CAPS, OR SMALL WHITE FIELD AGARIC.

BOTANICAL CHARACTERS.

Pileus: One to two inches broad; margin involute when young, then expanded and depressed in the centre. It is variable in shape, of a pure ivory white colour, and viscid when moist, which gives it a satiny lustre. Occasionally it has a tinge of yellow or pink. In damp weather the outer third of the pileus appears striated from the gill attachment shewing through the translucent structure.

Gills: Distant, deep, and thick, with connecting veins, sometimes forked above, adnate, breaking away from the stem as the pileus becomes depressed.

Stem: White, short, firm, stuffed, becoming more or less fibrillose and hollow, attenuated at the base, often eccentric.

HYGROPHORUS PRATENSIS.—*Fries.*

PASTURE HYGROPHORUS.

BOTANICAL CHARACTERS.

Pileus: Two to three inches broad, smooth, convex and more or less umbonate, spreading towards the margin, which is often broken; the centre or disc, compact and fleshy, of a tawny or buff colour.

Gills: Distant, thick, arcuate and deeply decurrent, connected by veins, and separable from the flesh of the pileus.

Stem: Even, lighter in colour, stuffed, attenuated downwards.

These Funguses are represented here not only because they are common and good eating, but also because they are distinct in character, easily to be recognised, and continue to appear in the meadows until the frosts of November put a stop to their growth.

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Hygrophorus virgineus. Ivory caps.

Hygrophorus pratensis Pasture Hygrophorus.

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The small white Field Agaric is particularly abundant, and although so small, a dish may be quickly gathered. In its young state it gets the name of *Ivory Caps*, but it quickly loses its convex shape, and then its fragile texture causes it to assume great irregularity. It frequently has a tinge of yellow, and appears broken and striated.

The only agaric with which *Hygrophorus virgineus* may be confused is its close relative, *Hygrophorus niveus*, the snow-white Hygrophorus, but since that also is esculent, it is not necessary to enter closely into their distinctive characteristics.

There are few notices of this agaric to be found in books, which is probably due to its insignificant size, and the fact of esculent funguses of larger dimensions usually presenting themselves to the epicure at the same time. It has long been known as esculent. Dr. Badham says "the taste is pleasant, the odour disagreeable." Mr. Berkeley's opinion that "it resembles the Fairy-ring Champignon in flavour," is generally endorsed. Mr. Cooke says, "Though small it is well worth the trouble of collecting, and merits a better acquaintance." It is, however, a much more tender agaric than *Ag. oreades;* it is certainly worthy of more attention, and when once fairly tried it will secure it for the future. It will often happen too that it may be plentifully gathered when other edible funguses are not to be met with.

The Pasture Hygrophorus is also a very excellent fungus, of pleasant appearance, agreeable odour and delicate flavour. It is more firm in texture than the last, and prefers a higher situation, on downs and short pastures, where it is often abundant. The pileus is always thick and fleshy; and in some situations, as in Holm Lacy Park and Gardens, it grows extremely thick and large in proportion to its size, and then takes very irregular shapes, but even then it cannot be mistaken for anything but itself.

This mushroom is scarcely noticed in books. "It is perfectly wholesome," says Mr. Cooke, "and if not quite equal to *H. virgineus*, it is certainly preferable to some that have been more strongly recommended."

It is of a tough and dry nature and requires the addition of gravy or milk in all culinary operations. Then, with the ordinary condiments, it should be stewed very gently for an hour, closely covered up, and served hot. Like all mushrooms of dry texture that require cooking for some time to make them tender, it is necessary to keep the temperature low, that its delicate flavour may not be lost. Mrs. Hussey, however, gives it but faint praise—"A tolerable dish in the deficiency of more dainty food."

"Ivory caps are very good eating. They are not unlike Oreades in taste, but they are more tender and delicate in flavour. Simply boiled or fried with the usual condiments they make an excellent dish at the breakfast table, and if the dish is piled up with them so much the better."—*Dr. Chapman.*

"Stew gently with fine herbs and delicate sauce."—*M. C. Cooke.*

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FAMILY II. GASTEROMYCETES.

ORDER IX. TRICHOGASTRES.

Peridium single or double. Hymenium at length drying up into a dusty mass of threads and spores.

GENUS: LYCOPERDON.

Peridium membranaceous, vanishing above or becoming flaccid. Bark adnate, subpersistent, breaking up into scales or warts. Capillitium adnate to the peridium and to the sterile base.

LYCOPERDON GIGANTEUM—*Batsch.*

GIANT PUFF-BALL, OR VEGETABLE OMELETTE.

BOTANICAL CHARACTERS.

Peridium very white above and obtuse, cracking into areæ, evanescent, very widely open; bark floccose, rather distinct; capillitium vanishing, together with the dingy olive spores.

The soft smooth surface, pure white colour, and large size of this Puff-ball, readily distinguish it from every other. Its surface closely resembles white kid leather. It may be gathered of any size from an ordinary apple to a Dunstable lace-pillow, but whatever the size may be, when the flesh is delicately snow-white in colour and firm in structure it is in the best edible condition.

As the Puff-ball ripens it becomes faintly tinged with yellow, and grows softer in structure. It must then be rejected without hesitation.

The Giant Puff-ball is by no means rare in Herefordshire, though not so frequently found as most of the other kinds of Puff-ball. It grows in low meadows or rich fold-yard orchards, and the richer the ground the larger it becomes. It is usually seen singly or in scattered groups, but occasionally it forms a large segment of a magnificent ring from 30 to 50 feet in diameter. Wherever it grows it is much too conspicuous to escape observation, and of course is made a football by the farm boys. It must frequently be kicked into the river, for they are often to be seen in autumn floating down the stream.

The representation given is extremely small being necessarily limited by the size of the page. It is not too much to regard it as usually from four to ten times as large as this picture. It is very difficult also to represent the smooth white ball it forms, as if covered with fine white kid leather. Its rapidity of growth is meant to be shown by the way in which it has pressed down the flowering stalk of a small and late blossom of the Self-heal, *Prunella vulgaris*, which is also drawn with it.

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Lycoperdon gigantium.

Vegetable Omelette.

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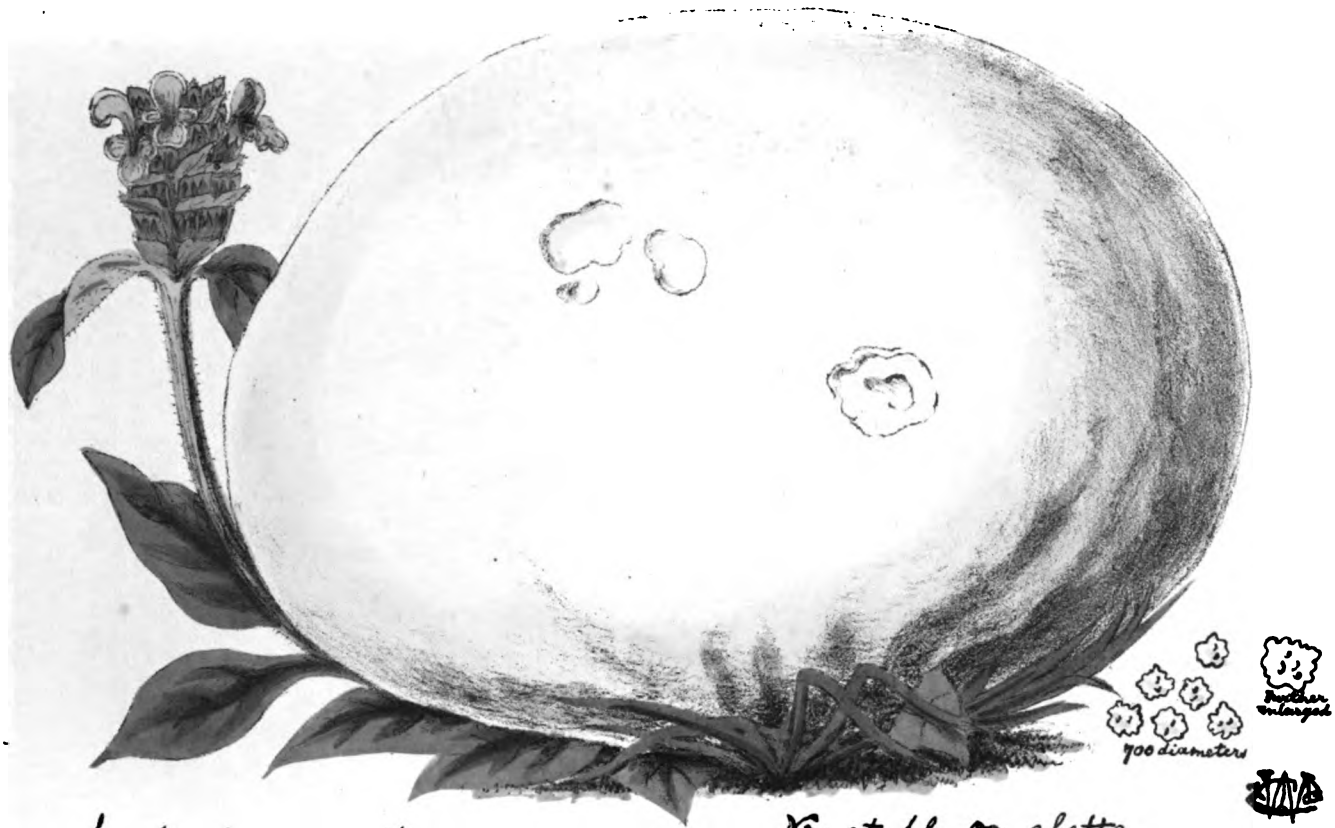

Lycoperdon gigantèum.

Vegetable Omelette.

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All the true Puff balls when young are edible, and those are the best and most delicate in flavour which are prolific throughout their whole structure, or in other words are without any stem or sterile base. Though all may be wholesome, however, they are certainly not all nice, for example, the most common of a large size in this county *Lycoperdon cælatum*, Fr. the Collapsing Puff-ball, has a flavour of a musty mouse-like character that certainly most people would think extremely disagreeable. On the other hand the small white globular Puff-ball about an inch and a half broad, called *Bovista plumbea*, P. because its external bark is lead-coloured is well flavoured, rich, and good.

This though very small, is extremely common after the warm rains of summer and autumn, and may be gathered in abundance. It is the one which so often deceives the ordinary mushroom hunters. They see its white coat from a distance, go to gather it, find it "only a Puff-ball" and crush it indignantly with their feet. In their ignorance quite unaware of the estimation in which it is held by the Italians. "Il Licoperdo piombino è uno dei funghi mangiativi più delicati che si conoscano. Il suo uso è pressoché generale."—*Vittadini.*

If the great Puff-ball excites the Rustic to kick it, the small Puff-balls equally call forth a propensity for pelting, which few people can resist—

> "My Phillis me with pelted Puff-Balls plies,
> Then tripping to the Woods the wanton flies."
>
> *Dryden.*

OPINIONS ON THE MERITS OF LYCOPERDON GIGANTEUM AS AN EDIBLE FUNGUS.

The Giant Puff-ball is thoroughly appreciated on the Continent, "an excellent ball for frying. "Vescie buone da friggere" is the Tuscan vernacular name for it. And its admirable qualities for culinary operations are generally recognised. It has been well stated by Vittadini.

"La sua carne candida compatta si presta facilemente a tutte le speculazioni del cuoca."

"Excellent. They are much lighter and more digestible than egg omelettes, and resemble brain fritters."—*Mr. Hussey.*

"It is excellent eating, and indeed has but few competitors for the place of honour at the table."—*M. C. Cooke*

"The *Lycoperdon giganteum* is a great favourite with me, as it is indeed with all my acquaintances who have tried it. It has not the high aroma of some others, but it has a delicacy of flavour that makes it superior to any omelette I have ever eaten. It seems, furthermore, to be so digestible as to adapt itself to the most delicate stomachs. It is the South Down of mushrooms." —*Dr. Curtis*, South Carolina, in a letter to the Rev. M. J. Berkeley.

"A delicate and delicious flavour."—*Worthington G. Smith.*

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"A delicious dish. No French omelette is half so good in richness and delicacy of flavour."—*R. Ward, in Cooke.*

"They who have tasted them once will require no pressing to induce them to repeat the experiment."—*Jas. Britten.*

THE MODES OF COOKING LYCOPERDON GIGANTEUM.

"As good wine needs no bush" so in my opinion the puff-ball requires no elaborate mode of cooking.—*James Britten.*

Cut in slices half an inch thick, it may be simply broiled, or fried with butter, pepper and salt, and when served up hot will meet with general approbation.

31. FRITTERS OF GIANT PUFF-BALL.

Cut slices half an inch thick; dip in yolk of egg; sprinkle with pepper, salt and sweet herbs; fry in fresh butter, and serve hot.

32. FRITTERS OF GIANT PUFF-BALL.

Fry the half inch slices in fresh butter with a very slight sprinkling of salt, and any preserve that might be available, and serve up hot.

Vittadini recommends, and the suggestion is a good in one consequence of the large size to which the Giant Puff-ball grows. "Whenever the fungus grows conveniently for the purpose, that it should not be all taken at once, but that the slices wanted should be cut off from the living plant, care being taken not to break up its attachment with the earth; in this way you may have a fine "frittura" every day for a week."

In its advanced state it was formerly used as tinder, since it smoulders without flame for a long time. "In divers parts of England, when people dwell far from neighbours, they carry the dry Fusse-ball kindled with fire, which lasteth long; whereupon they were called *Lucernarum Fungi*" (Gerarde's Herbal).—They were also formerly and still are used as a styptic to stop bleeding, and were recommended to be sent to the Continent for dressing wounds in this present war.

As an anæsthetic they have long been known. Old Gerarde again says "The country people do use to kill or smother bees with these Fusse-balls, being set on fire, for the which purpose it fitly serveth"—*(Herbal).*

CONCLUSION.

Herefordshire presents many other Esculent Funguses besides those which have been represented in these papers, but it will be sufficient to give a brief report of some few of them.

Agaricus campestris, L.—The common mushroom is so well known and so highly prized that it is not necessary to mention it further.

Agaricus arvensis, Schæff.—The Horse mushroom is also equally well known as the immense mushroom that grows so abundantly in large rings in our fields and orchards. It is commonly used for making catsup, but is thought

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to be dangerous as an article of food. This is a mistake; it is perfectly wholesome, and when grown quickly is thought by some members of the Woolhope Club to be equal to that smaller pattern of itself, the common mushroom. As a general rule it is, however, very inferior to it in flavour, and of a more dense and indigestable structure; good, when a better cannot be got, and this remark applies just as strongly to it as a catsup mushroom as for its edible qualities.

Lepista personata, W. Smith. 'Blewits', or the Lilac-stemmed Agaric.—This mushroom takes its English name from the blue colour of its stem. It is not so common in Herefordshire as in many other counties, but is valuable as an Edible Fungus from the late period of the year at which it continues to grow. It is in season when most of the others are gone, and thus has a special value to real mushroom eaters. "It has an agreeable taste," says Dr. Badham; "when not watersoaked it is a fine, firm fungus, with the flavour of veal, like which it is to be dressed *en papillottes* with savoury herbs and the usual condiments, and the more highly it is seasoned the better."

Lepista nuda W. Smith. The Amethyst Lepista, is also equally late in season and much more common in this county. It is still more blue than "Blewits." Its gills are often of an exquisite violet tint, and the colour very frequently pervades the whole mushroom, especially at a late period of the year. In the grounds of Whitfield and the woods of Dinmore it is often of a dull, deep blue throughout its structure.

An excellent mode of cooking *Lepista nuda* and *Lepista personata*, and one suited to the late period of the year at which they are found, is the following:

33. CURRIED MUSHROOMS.

Place a lump of butter in a frying pan with a sufficiency of gravy or milk, and a little curry powder, fry for 7 or 8 minutes, then throw in the sliced Agarics; fry gently for 10 minutes, and serve up quickly with sippets of toast.

Agaricus nebularis Batsch. The Clouded Mushroom, which bears a high repute for "its agreeable taste" (Bulliard). "When properly cooked," says Sanguinetti, "it is equal to any of our Funguses"; and "lighter of digestion, perhaps, than any other," adds Dr. Badham.

Single specimens are found in our woods, as at Haywood Forest, Mynde Park, Dinmore Woods, and probably many others.

Agaricus fusipes Bull. Spindle-stemmed mushroom, which, "when properly pickled has not many rivals," says Badham, is very common.

The Russulæ, "like craw fish when grilled," are common in Herefordshire. *Russula heterophylla*. *R. virescens* and *R. alutacea*, are to be found in most of woods.

Nor is Herefordshire altogether wanting in the production of the more celebrated Epicurean Funguses.

Tuber æstivum Vitt. The Truffle grows annually in the grounds of Holm

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Lacy, and of Whitfield, and in many other places probably. Growing beneath the surface of the ground they are difficult to find. In the absence of truffle dogs the squirrels may be watched, for they, too, are fond of such dainties. Where they are observed to scratch the truffle may be found underneath. When got it may "be simply boiled for an hour," says one, "Stew it in champagne," says Mrs. Hussey, "Roast it in the embers," says Mr. Berkeley, "Wrap it up separately in several folds of buttered paper, cover it with hot embers and leave it for an hour." These simple directions are given, since, as they are rarely found, they are usually wasted for want of them.

Cantharellus cibarius Fr. The Chanterelle, "that kalon kagathon of diet" (Badham) with the fragrance of the apricot, or the ripe greengage, is not very uncommon in Herefordshire. In Haywood Forest it is sometimes very plentiful, growing in rings and clusters. On the Malvern Hills, and many other high localities, it is also to be found. All authorities, Italian, French, Austrian, and English, unite in its praise, which Vittadini points by the superlative "*sapidissimus.*" It should be stewed in gravy, or fricasée, at the lowest possible temperature until quite tender. If cooked fast or with much heat its delicate flavour is simply lost.

Morchella esculenta P. The Morel is rare in Herefordshire, since it favours an oolite or limestone soil. It is, however, to be found in some localities, and should be looked for in places where charcoal has been made. At Byford, it comes up year after year on the site of an old hedge row.

Helvella crispa Fr. The Mitred Morel, its close relative, is less uncommon and sometimes plentiful in certain localities. Its flavour is excellent, but like the Morel it requires stewing at a low temperature for some time, and like it too if you "stuff it with mince meat and bread crumbs and stew it slowly in hock," it will doubtless prove delicious.

Many others might be mentioned as occurring in Herefordshire, but it is not necessary to name them here.

A more general knowledge of the properties and capabilities of native esculent plants is most desirable. It would form a very useful and important branch of popular education. The Chinese have long since recognised its value. They have provided themselves with a work in six volumes, called the "Anti-Famine Herbal,"* which gives drawings and descriptions of 414 different wild plants which are fitted, in one way or other, to furnish food for the people. The Chinese Government distributes thousands of copies of this book every year gratuitously in the different districts of the Empire: and thus, in times of distress—when bad seasons cause the crops of rice and grain to fail, when great floods or drought occur, when the ravages of locusts or other insects destroy vegetation, or when the devastating presence of armies cause the ordinary

*A copy of this Chinese work was presented, in to 1846, the Academy of Science in Paris by M. Stanilaus Julien.

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supplies of food to cease—the suffering people are able to take every possible advantage of the natural products of the country. Such information must also prove most useful in the many cases of individual poverty and distress which present themselves in every-day life, apart from such great calamities.

The chief object of these papers on Edible Funguses has been to show that the large amount of food as palatable as it is wholesome and nourishing, which they would provide, is annually wasted. In the thinly populated agricultural districts of Herefordshire, where wages are low and families often large, this food may be had for the trouble of gathering it, throughout the summer months. The Rev. M. J. Berkeley tells us of a schoolmaster in Northamptonshire, who, when he could not afford to buy food for his children, kept them for several months on mushrooms. Why should not the agricultural labourers in Herefordshire do the same? It is seldom they get any other meat than bacon, but if when they fry this, they could add slices of any of the Funguses we have described, how much more rich and savoury the dish would be, and how much farther it would go in feeding the family. Why should they not? Simply because they want the information which would enable them to distinguish these Funguses. They know the common mushroom and fully appreciate it, and yet with even less difficulty they might be taught to know the others, for the majority of them are really more distinct in character. There is no doubt a very deep prejudice against them, and a generally prevailing opinion that all but the common mushroom are poisonous. This is not the case. Some are poisonous certainly, but they, too, can be as readily known as the poisonous plants of the ordinary kind. The poor on the Continent, and indeed all classes of society there, know the good ones enough, and eat them largely for many months in the year. They are called there "the manna of the poor."

The influence of example is great, and when the better classes who are lovers of the Common Mushroom have learnt to know that before this Fungus comes in, or after its season is over, there are many others all wholesome and more or less excellent in flavour to supply its place, the poor, too, will learn to know, and value them.

In the end of April, or the beginning of May, the Fungus season begins with the appearance of the true St. George's Mushroom, *Agaricus gambosus*, growing in fairy rings. These are quickly followed by the little fairy ring champignon, *Marismus oreades*, scattered specimens of the Horse Mushroom, *Agaricus arvensis*, clusters of the maned Agaric, *Coprinus comatus*, which in warm sunny seasons may be gathered all through the months of May, June, and July, and in the last month *Boletus edulis* will have put in its appearance. Then comes the great season of the common mushroom, *Agaricus campestris*, which may be allowed to reign supreme through July and August. From this time through September and October the great crop of Funguses will appear. Besides those already named there will abound the fine-flavoured Parasol Agaric, *Agaricus*

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procerus; the rich Red Milk Agaric, *Lactarius deliciosus;* the brown Warty Agaric, *Agaricus rubescens;* the great Puff-ball, *Lycoperdon giganteum;* the Vegetable Beefsteak, *Fistulina hepatica,* on the decaying oak trees; Vegetable Sweetbread, *Agaricus orcella;* the Plum Mushroom, *Agaricus prunulus;* the pasture Hygrophorus, *Hygrophorus pratensis;* and many others. The seasons will then be carried on by the Spiked Mushroom, *Hydnum repandum;* the small but very abundant Ivory Caps, *Hygrophorus virgineus;* by Blewitts *Agaricus personatus* and by the Amethyst Lepista, *Lepista nuda,* until the frosts of November and December stop their growth.

These Edible Funguses are specially named because they have such distinct characters of their own that they could be as easily recognised by common people as the ordinary mushroom. They only require to be once known always to be recognised.

Will any one teach them to know and value these home plants? In the education movement now being so vigorously pushed forward let us hope that information of such practical usefulness will not be altogether omitted.

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The Woolhope Naturalists' Field Club.

ANNUAL MEETING.

THURSDAY, FEBRUARY 23RD, 1871.

The annual meeting of the Woolhope Club was held at the Green Dragon hotel, on Thursday, and was attended by the following gentlemen:—The Rev. Henry Cooper Key, M.A., F.R.A.S., president; Mr. Thomas Cam, president-elect; Mr. James Rankin, R.A., the Rev. A. Gray, and the Rev. W. C. Fowle, vice-presidents; Dr. Bull, Mr. T. Curley, F.G.S., and Mr. John Lloyd, the central committee; Mr. R. Lightbody, F.G.S., Ludlow; Dr. M'Cullough, Abergavenny; the Rev. James Davies, Moorcourt; the Rev. J. F. Crouch, Pembridge; Mr. Edward Foss, Inner Temple; the Rev. Thos. Phillipps; Mr. A. Armitage; Dr. Chapman, Burghill; the Rev. W. J. Thomas, Llan Thomas; Mr. E. Pateshall; Mr. B. Haigh Allen, Priory, Clifford; the Rev. R. H. Williams, Byford; the Rev. F. Merewether, Woolhope; the Rev. C. J. Robinson, Norton Canon; Mr. David Lawrence, Pontypool; the Rev. E. Machen Jones; the Rev. T. W. West, Fownhope; Mr. C. G. Martin; the Rev. R. Bamford; the Rev. D. George; Mr. William A. Swinburne, Cusop; the Rev. F. T. Havergal; Mr. F. R. Kempson; the Rev. T. T. Smith; Rev. J. H. Jukes; Mr. J. F. Symonds; the Rev. E. A. Evans; Mr. Thomas Turner; the Rev. C. J. Westropp; Mr. Flavel Edmunds; Mr. Henry Southall, Ross; Mr. James W. Lloyd, Kington; Mr. F. E. Harman, The Valletts; and Mr. Arthur Thompson.

The financial statement was read, and ordered to be printed. Mr. F. E. Harman was elected as a member, and several other gentlemen proposed for election at a future meeting.

The following days and places were appointed for the Field meetings for the present year:—

Friday, May 26th, Hay, for Cusop Dingle;
Tuesday, June 20th, (Ladies' meeting) the Aberedw Rocks;
Thursday, July 20th, the Carmarthen Vans;
Tuesday, August 29th, Ross, for the Forest of Dean; and
Tuesday, October 10th, Hereford, for a Foray among the Funguses.

THE REPORT FROM THE MUSEUM COMMITTEE.

Mr. President and Gentlemen of the Woolhope Club.

The committee, appointed by you at your last annual meeting to inquire into the question of a museum in connection with this society, have now the honour of laying the report before you.

Your committee, having considered the bearings of the subject from every point, and being most desirous of making the scheme as generally useful as

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possible, have upon the testimony and advice of several of the leading men of the county and city, determined to recommend the addition of a Free Library for the town of Hereford to the original scheme, believing that, in so doing, the possible usefulness of the scheme will be greatly enlarged, and also that its efficiency and durability will be materially ensured.

In order to facilitate the carrying out of the scheme, funds have been placed at the disposal of the committee to purchase a site and erect suitable buildings for the institution; and the committee, by the kind aid of friends interested in the scheme, have obtained sufficient promises of annual support to justify them in recommending that the scheme should be set on foot; especially as the Town Council (at a recent meeting) has given the committee reason to believe, that should the institution be established, their support, by means of a small rate, would not be wanting.

Should the Institution be established, the management would, in all probability, be placed in the hands of a Joint Committee, appointed by this society and the Town Council.

Although it would be premature for your Committee to announce any details positively, yet they believe that the scope and aim of the Institution would be to give a Free Library and Reading-room to the town of Hereford, a Museum for the instruction and benefit of the people, and a safe depository for the collections of the scientific members of the community, and also to afford a good Lecture and Meeting-room.

The committee have also in view a separate and private room for the meetings of this Society, and for the use of those members of this, and other Societies who would be willing to subscribe to it, and the committee would endeavour to provide a good scientific Library.

Such being the position of affairs, your committee have no hesitation in recommending the scheme to your adoption, feeling confident that the only element necessary to ensure the success of the undertaking, is the hearty and cordial co-operation of the members of this Society.

Signed by

Rev. H. COOPER, KEY, Chairman.
Rev. Sir G. H. CORNEWALL, Bart.
Rev. C. J. ROBINSON.
Rev. J. DAVIES.
A. ARMITAGE, Esq.
Dr. M'CULLOUGH.
J. RANKIN, Esq., Secretary.

This report was unanimously adopted by the Club, amid great applause, and the same Committee, with the addition of Mr. Thos. Cam, the President for the year, Dr. Bull and Dr. Chapman were appointed a committee to confer with the committee from the Town Council with reference to the details of the project.

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METEOROLOGICAL REPORTS FOR 1870.

BY E. J. ISBELL, ESQ.

A careful inspection of the Meteorological Tables now presented will show, what certainly our bodily feelings have already taught us, that the year 1870 was a very remarkable one indeed.

The drought was excessive; and the temperature, at one period equal to the hottest day of 1868, was at another lower than any degree of cold I have ever before recorded at Hereford.

It will be remembered that 1864 was also a very dry year; until 1870 it was, I believe, the dryest on record at this place; the yearly total of rainfall that year being, according to the Blue School rain-guage (6 feet 3 inches from the ground), 19.318 inches; and according to my five-inch guage at the St. Owen's end of the town (12 inches from the ground), 20.146 inches. This year my 8-inch gauge at Richmond-place (5 feet 3 inches from the ground), gave a total of 18.631 inches; and the 8-inch gauge at White Cross (one foot from the ground) 18.985 inches. To the best of my knowledge, therefore, 1870 has proved at Hereford the dryest year on record.

The effects of the drought in 1870 were very mischievous, are still severely felt, and will, I fear, be felt for a considerable time to come; for the year was dry throughout, and the dryest months—April, May, and June—were precisely those months in which rain is most needed for young vegetable life.

The temperature too of the summer months of 1870 was, as already observed, occasionally very high. On the 22nd of June, the maximum reading was 92°; and in July the temperature on the 22nd, 23rd, and 24th, fully equalled the hottest days of 1868, the maximum readings being as follows:—22nd, 95,2; 23rd, 94.7; 24th, 96.

This combination of drought and heat has certainly been very disastrous, and the worst consequences have probably yet to be encountered. Around Hereford hay-making in 1870, was a thing almost unknown, and even in the Vale of Taunton, I am informed, good hay imported from Ireland is eagerly bought up by the farmers at £7 10s. the ton. At Hereford it is now selling at £8 the ton.

With the heat and drought came a plague of minute flies, which, about the end of September, caused vast mischief to vegetation. Some strong evergreens near my own house were covered with these flies and afterwards appeared as though they had been struck by lightning. They have remained in a blighted half dead condition ever since.

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To crown all, this extraordinary heat of the summer was followed by one of the severest Christmas frosts ever known in these parts. On the morning of December 31st the thermometer at Rocklands, near Ross, went down to zero, at Leominster, to one degree above zero, and at Hereford the reading was 2·1.

At Whitfield, I am informed by Dr. Bull, several thermometers, watched through the night by the gardeners, gave 4° below zero for their lowest reading.

This severe frost began on the 21st of December and ended on the 5th of January. My minimum readings were as follows :—December 21st, 28·9; 22nd, 20; 23rd, 13·4; 24th, 8·9; 25th, 6·8; 26th, 19; 27th, 13·8; 28th, 20; 29th, 27·5; 30th, 12·5; 31st, 2·1; January 1st, 7; 2nd, 26; 3rd, 19·8; 4th, 25; 5th, 14·5.

The very low temperature at Whitfield on the morning of December 31st need not surprise anyone, for Whitfield House stands on ground more than 400 feet higher than Hereford.

Before I quit the subject of the frost I must state that the Wye was frozen across, and "bore" well on January 1st. On the 2nd I walked with a party up the centre of the river from the boat station above the bridge to the railway bridge, and am told that I might have safely extended my walk to Belmont.

The yearly mean of 9 a.m. barometer readings during 1870 was slightly above the average. The hightest reading was registered on December 2nd (30·443), and the lowest on January 8th (28·648); the mean of all readings during the year being 29·785. The barometer cistern is 187 feet above sea level so that it will be necessary to add 0·20 inch to the figures given above in order to compare the Hereford observations with those made on the sea-shore.

In the spring of 1870 the Woolhope standard barometer was set up at Mr. Southall's house at Ross (The Graig, Archenfield), probably 100 feet above the river, and simultaneous observations were made during March and April, in order to ascertain the difference of level. On comparing all the readings, the difference between Hereford and Archenfield amounted to 0·115 inch; the mean of the March readings being exactly the same as that of the April ones. There was, however a slight difference of mean temperature between the two months so that the calculation for March made the Ross cistern 103·22 feet higher than the Hereford one, and the April work made the difference 104·39. A very close agreement considering the distance.

The Ross cistern stood probably 10 or 12 feet above the lawn where Mr. Southall places his instruments. My cistern stands 5 feet above ground, and is 187 feet above sea-level.

The Woolhope standard was afterwards placed at Sellack Vicarage, and the difference of the level between the two cisterns was found to be 67·5 feet.

It would be well if those members of the Club who keep rainfall or thermometer observations and wish to know their height above sea-level would take charge of the standards belonging to the Club in turn and compare their observations with those made at Hereford, where the height of the barometer

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above sea-level is known. A little training is necessary in order to set and read a standard; but this is a trifle, and a day or two will be time sufficient to make the observer expert enough. Should the distance between two places be less than two miles, the measurement of altitude may be made at once with tolerable accuracy; but should the distance be greater it will be well to multiply the simultaneous observations as much as possible, and calculate the height from the mean of all readings at both stations.

In some notes of mine relative to the past year I find two notices of Aurora seen previous to the grand display of the 24th of October thus:—"January 7th, 8th a very heavy gale, preceded by red aurora"; and again:—"September 24th, fine aurora, white and red, about 10 p.m." The police speak of another striking aurora, but I have forgotten the date.

On the 24th of October, however, most of us beheld a sight which is not likely to be forgotten, and which in this part of the globe is seldom equalled, probably never surpassed. I find I have only time and space to give my notes of this wonderful exhibition just as they stand in my meteorological daybook:—"October 24th, magnificent red aurora, 7.45 p.m. to 8.30 p.m. Commenced with white light in the west and N.E. Began to show red in the N.E. at 7.30. Shot up a magnificent red column in the N.E. at ten minutes to eight. Then spread out into deep blood red all across the eastern sky. Another magnificent crimson display in the west. White and rose coloured columns shot up from east and west, and met at the magnetic zenith. White bars passed across the red column in the N.E. causing an appearance of flickering light.

25th. Repetition of aurora, 6 to 7 p.m.; shafts running up to magnetic zenith as before. Not so striking as the display of the 24th because of the remaining daylight."

A correct notion of altitude, or height above sea level, is frequently of such importance to scientific observers that I again refer to the subject, and add a few remarks to those made in my paper for 1869.

The Ordnance bench mark on the tower of Weobley Church is, I believe, the bench mark nearest to Hereford; therefore, if it had not been for the work of the railway engineers it would have been necessary to have run levels from that point to this place, in order to fix the altitude of Hereford by spirit levelling. However, through the kindness of Mr. Roberts C.E., we have been for some time past acquainted with the altitudes of the Moorfield and Barton Stations, and now I have to thank Mr. John Southall, of Leominster, for information which enables me to give that of the Barr's Court Station also.

Some time since Dr. Bull obtained from the R.W. Engineer's office at Shrewsbury the height of the rails at Leominster Station above those at Barr's Court (57 feet), and as there are bolt bench marks at Leominster I felt anxious to get the R.W. levels at Leominster connected with those of the Ordnance survey. Mr. Southall, with the assistance of a friend,* has managed this, and I am now able to report that the bench mark on the Leominster Town-hall

* Mr. W. Bowles.

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is 250·478 feet above the sea, and 19·5 feet above the rails at the Leominster Station; the rails, therefore, at the Leominster Station are 230·978 feet above the sea, and those at Barr's Court 173·978 feet.

ALTITUDES SENT BY MR. ROBERTS, C.E.

ORDNANCE BENCH MARKS, HEIGHTS OF HILLS FROM ORDNANCE MAP, &c.

Altitudes along the Railway from Hereford to Hay: Decimals omitted.

	Above Sea Level.
Levels of rails at Hay	254 feet.
,, Whitney Station	259 ,,
,, Eardisley	230 ,,
,, Moorhampton	337 ,,
,, Credenhill	251 ,,
,, Moorfield	179 ,,
,, Barton	175 ,,
,, Barr's Court	174 ,,
,, Rails on bridge over canal at Widemarsh	184 ,,

Levels of rails on a portion of the Newport Railway:—

	Above Sea Level.
,, Tram Inn Station	289 ,,
,, St. Devereaux	281 ,,
,, Pandy	345 ,,
,, Llanfiangel	472 ,,
,, Pontrilas	365 ,,
,, Abergavenny	236 ,,

Ordnance Bench Marks.

	Above Sea Level.
Eardisley Church	255·884 feet.
Weobley Church	316·390 ,,
Dishley-street, Leominster	264·355 ,,
Town Hall, Leomister	250·478 ,,
Leintwardine Church	440·035 ,,

Heights of Hills—Ordnance Map.

	Above Sea Level,
Garway Hill	1,197 feet.
Worcester Beacon	1,395 ,,
May Hill	973 ,,

It may be interesting and perhaps useful to many to know that the longitude and latitude of Hereford Cathedral are as follows:—

Longitude ..... 2° 42′ 53″·5 W.
Latitude ..... 52° 3′ 13″·9 N.

The difference of time between Greenwich and Hereford is 10 min. 51 sec.; Greenwich being, of course, by so much, faster than Hereford.

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TABLE I.

1870.	BAROMETER. Highest reading at 9 a.m., corrected but not reduced to sea-level.	DATE.	Lowest reading at 9 a.m., corrected but not reduced to sea-level.	DATE.	Monthly Means of 9 a.m. readings.	WIND. N. Days.	N.E. Days.	E. Days.	S.E. Days.	S. Days.	S.W. Days.	W. Days.	N.W. Days.
January	30·374	19th	28·648	8th	29·764	1	3	5	1	9	7	2	2
February	30·252	12th	29·205	28th	29·658	3	8	1	2	6	1	2	2
March	30·303	28th	29·326	2nd	29·868	2	9	1	0	1	2	0	6
April	30·326	4th	29·213	9th	29·972	0	1	0	1	3	7	6	2
May	30·240	25th	29·119	12th	29·859	3	1	1	1	5	9	1	1
June	30·374	6th	29·564	10th	29·939	2	3	0	0	2	5	6	4
July	30·093	20th	29·547	12th	29·816	1	6	0	2	2	7	6	2
August	30·129	13th	29·262	28th	29·816	2	6	3	1	4	1	1	9
September	30·298	16th	29·131	7th	29·872	0	5	0	6	2	9	1	1
October	30·397	1st	28·764	23rd	29·532	0	6	0	0	3	10	4	2
November	30·344	2nd	28·943	23rd	29·591	3	5	1	3	2	4	3	2
December	30·443	2nd	29·022	12th	29·737	4	8	2	1	0	2	1	5
	Yearly Mean of 9 a.m. readings.....				29·785	21	61	14	18	39	64	33	38

Cistern of Barometer 187 feet above sea-level.

EDWIN J. ISBELL,
WILLIAM COOKE.

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TABLE II.

THERMOMETERS.								
1870.	Highest reading in shade; and date.		Lowest reading; and date.		Mean of maximum readings.	Mean of minimum readings.	Mean of 9 a.m. read. in shade.	Monthly means.
	Degrees.	Date.	Degrees.	Date.	Degrees.	Degrees.	Degrees.	Degrees.
January	52·1	16th	16·9	28th	43·77	32·82	37·05	38·09
February	56·3	28th	21	11th	42·41	32·69	36·92	37·15
March	60·8	17th	20	14th	50·35	33·99	40·73	41·17
April	81·1	20th	27·1	5th	63·30	38·92	50·9	49·61
May	84	21st	29	4th	68·82	43·29	56·14	54·35
June	92	22nd	40·9	2nd	76·10	51·73	64·55	62·11
July	96	24th	44·8	2nd	79·68	55·03	66·23	65·45
August	86·2	11th	37·8	31st	76·39	50·32	63·62	61·65
September	76·7	29th	36·2	24th	69·08	46·27	55·94	56·37
October	71	1st & 2nd	27·6	11th	58·14	41·96	50·13	49·05
November	55·4	24th	25	17th	47·40	34·36	39·89	40·48
December	55·8	14th	2·1	31st	38·29	26·86	29·16	32·57

Yearly Mean Temperature 49·05.

Thermometers 4 feet above ground and 186 feet above sea-level.

EDWIN J. ISBELL.
WILLIAM COOKE.

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TABLE III.

RAINFALL IN HEREFORDSHIRE.

1870.	Hereford. Richmond-place. 5ft. 8in. from the ground.	White-cross, 1 mile from Hereford. 1ft. from the ground.	Bredwardine Hereford-shire. 1ft. 0in. from the ground.	Tupsley. 1 foot from the ground.	Stretton 1 foot from the ground.	Leominster. 1 foot from the ground.	Sellack. 3ft. 6in. from the ground.	Archenfield, Ross. 1 ft. from the ground.	Rocklands, 1ft. 11in. from the ground.	Hagley Park. 6in. from the ground.
January	1·964	2·078	2·32	1·62	1·60	2·05	1·97	2·06	3·17	1·71
February	1·966	1·839	2·45	1·79	2·06	1·77	1·75	1·96	3·47	1·83
March	1·408	1·433	1·82	1·42	1·57	1·54	1·44	1·36	1·57	0·97
April	0·642	0·678	0·28	0·63	0·56	0·64	0·60	0·63	0·42	0·47
May	1·020	0·910	1·39	1·04	1·08	0·95	1·24	1·22	1·66	1·01
June	0·220	0·183	0·23	0·22	0·21	0·24	0·43	0·55	0·44	0·31
July	1·194	1·179	1·46	0·98	1·02	0·92	2·59*	1·16	1·38	1·17
August	1·048	0·980	1·03	1·02	0·40	1·05	1·05	1·17	1·47	1·17
September	1·464	1·266	1·29	1·06	0·86	0·92	1·46	1·65	1·67	1·39
October	3·881	4·283	5·64	3·74	3·96	4·58	4·09	3·72	4·71	3·38
November	2·398	2·441	3·29	2·68	1·78	2·53	3·06	3·25	4·15	2·23
December	1·426	1·715	1·82	1·48	1·67	1·68	1·59	1·45	2·09	1·38
Totals	18·631	18·985	23·02	17·68	16·77	18·87	21·27	20·18	26·20	17·02

*1.84 in. fell in 35 minutes.

NOTE FOR TABLE OF RAINFALL.—Hereford at Richmond Place is 182 feet above sea level; Bredwardine is 11 miles from Hereford W. by N., and (supposed) 290 feet above the sea; Tupsley is 1½ mile E. of Hereford, and about 232 feet above the sea; Stretton is 2 miles W.N.W. of Hereford, and probably 15 feet higher than Hereford; West Lodge, Leominster, is about 12 miles N. of Hereford, and 264 feet above the sea; Sellack Vicarage is 8¼ miles S.S.E. of Hereford, and about 240 feet above the sea; Archenfield, Ross, is 11½ miles S.E. by S. of Hereford, and 280 feet above sea level; Rocklands is 14 miles S.S.E. of Hereford, and more than 100 feet above the sea; Hagley Park is 3 miles E. by N. of Hereford.

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REMARKS ON THE FLOOD WATER OF THE WYE, 1870.

BY JOHN LLOYD, ESQ.

Instead of remarking on the flood-water, we have to notice its almost entire absence during the spring and summer months. The river was never known to be continuously low for so long a period, extending from the 26th March to the end of August. The drought exceeded that of 1868, and far exceeded that of 1869. It was very painfully felt in this county, and especially so as occurring in the spring as well as the summer months. The entire absence of dew at night was very remarkable in April, May, and June. Often when going out fishing at four a.m., I crossed the river side meadows without damping my boots in the least. The height of the river, if carefully observed, serves as an accurate rainfall register; and a good or bad fishing season is a pretty good index of the height of the river. A large rainfall, a flooded river, and a good fishing season keep each other company. It is needless to remark, therefore, that the fishing season of 1870 in the fresh water has been inevitably bad—in fact almost a blank. As an instance how valuable statistics of almost any kind may become, I was lately applied to for copies of these flood-water registers by an officer of the Privy Council, who was reporting on the water supply of Ross; they have been, I believe, of great use to him; but would have been of greater, if they had extended back to a particular day in November, 1866. Samples of the flood-water have been taken during the year, and steps are about to be taken to ascertain the amount of sediment.

(See Table on next page.)

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Register of Height of River in the Year 1870; taken daily at Hereford Bridge at 9 a.m. The datum point is the summer level of the river.

1870.	No. of days wet or stormy.	No. of days dry.	Height of river above Summer level.	Average height each day.	No. of days of low water.	RAINFALL.				OBSERVATIONS.
						Hereford.	Rhayader.	Llanwrtyd.	Llandrindod.	
			Ft. In.	Ft. In.		Inches	Inches	Inches	Inches	
January	8	23	90 11	2 9	4	1·964	4·43	4·60	3.39	Height of river on 9th, 9ft.
February	14	15	137 10	4 1	..	1·966	4·65	2·71	0·30	River full throughout this month.
March	5	26	51 11	1 1	12	1·408	3·54	3·67	2·37	Drought commenced about the 26th.
April	2	28	0 10	0 0½	29	0·642	0·76	1·57	0·60	Drought continued.
May	3	28	20 10	0 8	21	1·020	3·23	2·89	2 45	Drought continued; a small fresh on the 13th, 4ft. 8in.
June	...	30	...	0 0	30	0·220	1·09	1·42	1·5	Drought continued.
July	1	30	5 3	0 2	27	1·194	2·21	2·09	0·78	Drought continued; a small fresh on the 7th, 2ft. 3in.
August	1	30	3 6	0 1½	29	1·048	2·14	2·37	0·99	Drought continued; weather changed on the 29th.
September	5	25	48 4	1 7	8	1·464	4 54	4·27	1·7	Weather still dry; small freshes throughout the month.
October	16	15	139 6	4 6	2	3·881	14·99	13·26	8·71	River full throughout this month. Height on the 16th, 13ft. 6in.; 23rd, 14ft.
November	13	17	119 5	4 0	...	2·398	4·96	6·05	4·05	River full throughout this month. Height on 25th, 13ft.
December	7	24	46 9	1 6	...	1·426	3·76	2·69	1·98	A dry month compared with those of 1868 and 1869. Severe frost commenced on the 21st.
Totals, 1870	75	291	665 1	20 5½	162	18·631	50·30	47·59	27·14	
Total, 1868	86	280	704 8	22 11	129	28·531				
Total, 1869	107	258	940 9	31 1	79	30.96	55·14	39·59*	26·51*	

* Total for eight months only.

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RECORDS OF METEOROLOGY.

(Continued from Page 86.)

BY MR. HENRY SOUTHALL, F.M.S.

GALES AND ELECTRICAL DISTURBANCES.

These meteorological occurrences are usually so marked in character as to ensure their being recorded, and amongst these numerous records the difficulty consists in distinguishing what is really remarkable from that which is of more frequent occurrence. One thing is well attested, that for many centuries the British Islands have been subject to the occurrence of fierce gales and storms, principally from the S.W. or W., coming apparently pretty directly from the Atlantic ocean and called by many, equatorial or tropical gales. More rarely, however, but still not unfrequently, we are visited by north-easterly storms bringing with them a polar rigour, yet, from the cyclonic character which appears to be a feature of almost all severe gales, it by no means follows that these have come to us from the Arctic regions. Time will not permit us to enter into the origin, progress, and subsidence or disappearance of these cyclones. They sometimes attain the extreme pressure of nearly 40lbs. to the square foot, whereas 25lbs. pressure per foot is a very violent gale, and their rate of progress (not the velocity of the wind) being probably about fifteen miles an hour. The subject has of late received much more careful attention than had previously been bestowed upon it, and there are not wanting, signs of such an increase of knowledge of the laws and proximate causes of these phenomena as to lead us to hope that before long it will be possible to forecast storms with something of the same certainty as the astronomers are now able to foretell eclipses and other astronomical wonders. And when we consider the vast amount of property annually lost in shipwreck, the importance of this subject cannot well be overrated.

We will now proceed to give instances which have been recorded from time to time, the earliest, probably, by the Saxon chroniclers, afterwards collected and noted by such historians and antiquarians as Stow, Camden, and Leland, as well as a century later by J. Goad; still later, by Gilbert White, Luke Howard, and Dr. Dalton, to say nothing of the many more recent observers. Local details of disasters produced by the storms in this district during the last 100 years are to be found in the columns of the *Hereford Journal*, and possess considerable interest.

55 B.C. The first record of any violent gale was that of the 30th August, 55 B.C., at the landing of Julius Cæsar with his army on these shores. Most of you are so familiar with his description of it that it will not be necessary to recall it.

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234 A.D. With a long interval, the next storm recorded occurred this year at Canterbury.

277. Several people were killed in London.

301. An equally fatal storm took place at Winchester.

349. 420 houses in Carlisle were blown down.

416. Great part of Colchester was destroyed.

458. Many houses in York were very much injured.

549. 250 inhabitants of London lost their lives.

566. A severe storm on the coast of Kent, Sussex, and Hampshire.

701. 100 houses blown down at Lincoln.

772. A great storm occurred at Wells.

781. Another at Coventry.

919. At Cambridge 40 houses were destroyed.

921. At Manchester a violent storm took place.

944. 1500 houses in London were unroofed or destroyed by a storm which was felt over nearly the whole country.

951. Southampton nearly destroyed by lightening.

1055. 500 houses blown down in London.

1091, Oct. 5. The steeple of Winchelscombe, Gloucestershire, was blown down.

A steeple at Old Sarum was also destroyed the same year.

St. Duneln records that it took off the whole roof of St. Marylebow Church and carried it a long way. There were four beams, 26 feet long each, that fell with such force in one of the streets which were not then paved, but of moorish ground, that they could not be pulled up, but had to be sawn off even with the ground.

1221. "During a violent tempest fiery dragons and flying spirits were seen careering through the air."

1222. A storm occurred which threw down several churches.

1205 or 1203. Many lives lost and houses overthrown. The corn in the fields destroyed by hail as large as hens' eggs.—*Chronicle of the Mayors of London.*

1223 or 1233. Thunderstorms in England for fifteen successive days with great rains and gales.

1233, April 8. In Herefordshire and Worcestershire, "4 sunnes besides the true sunne of a red color; also portions of eight circles appeared."

1251. "Fearful tempest upon the seas." The chimney of the chamber where the Queen of King Henry III. and her children lay was blown down, and their whole apartment shaken. Many trees in the park were rent asunder and torn up by the roots.

1282. Great gales in the eastern counties. The monastery at Spalding and many churches were destroyed.

1285. A great thunderstorm in London.

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1361. Men and beasts perished in divers parts with thunder and lightning.

1382, January. A great gale on the south coast, when many houses were thrown down, cattle destroyed, and trees uprooted.

1389. A similar tempest occurred.

1359. A storm took place in Normandy which has great British interest, for Edward III. was then on his march and within two leagues of Chartres, when a tempest of rain, lightning, and hailstones of so prodigious a size occurred as to instantly kill 6,000 of his horses, and 1,000 of his best troops.

1413 or 1438 (both dates given, the first probably correct), Nov. 25th. The whole side of a street, called the Old Exchange, London, was beaten down, and the leads of the Grey Friars Church torn off.

1441. St. Paul's steeple fired by lightning, and the steeple of Waltham Cross consumed.

1479. At St. Neot's, Huntingdonshire, hail fell measuring 18 inches round.

1561. At Dorchester the pellets of a hailstorm were seven inches in circumference.

1545. June 25, hurricane in Devonshire, "whereby trees were overturned, churches, chappels, houses uncovered."—*Stow.*

Hail in Derbyshire at the same period "as big as a man's fist."—*Howes.*

1558. July 11, "at Nottingham, whirlwind and thunder, beating down churches, heaving water into the air, hail 15 inches in circumference."—*Howes.*

1579. September and October, great winds without rain at Newport, Bedford, Chester, &c.—*Howes.*

1570 or 1571. Oct. 5, tremendous gales in the midland and eastern counties.

1571. Feb. 17, at Kynaston, between Ross and Hereford, the ground rose upon the surface of a hill amid much rumbling noise, became detached from the subsoil, and shifted or slid some distance, carrying with it trees, flocks, and sheepfolds. It laid bare a gap covering something like 20 acres, consisting of a rugged and disturbed patch of ground. The convulsion overturned Kynaston chapel.

1574. Feb. 26, another shock was felt in the "three choirs" district, when Stow tells us "Bookes were thrown from their places, bells tolled, and chimnies fell."

At Tewkesbury, Feb. 14, after a flood which was not great, great numbers of flies and beetles came down the river a foot thick above the water.—*Goad.*

July 30, great tempest, lightning, and thunder.

1586. Nov. 29, a violent gale on the eve of St. Andrew, accompanied by severe frost.

1593. March 21, Alrewas, Staffordshire. This year was an exceeding great tempest of winde. In Lichfield, St. Mary's and St. Michael's blown down; also steeples, barns, and dwelling-houses, and trees, &c., innumerable in every place.

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1592. Sept. 6th, boisterous winds, driving out the water of the Thames.—*Howes.*

1596. Dec. 5, a thunderball at the Cathedral at Wells while the doctor was discoursing of spirits.—*Stow.*

1638. May 3rd, Ascension Day, Wallingford church was fired by lightning.—*Goad.*

1639. Dec. 24th, a dreadful tempest, insomuch that 24 ships cut off their masts, being in the Downs.—*Goad.*

Dec. 27, so violent a tempest that many of the boats which were drawn up to land at Lambeth were dashed to pieces, the shafts of two chimneys were blown down upon the roof of the Archbishop's chamber; one of the pinnacles of Croydon church and another at Canterbury were blown down—*Dr. Heylin's History, Presbyterian.*

1628. January 28, a terrible south gale, many houses and trees thrown down.

1642. Aug. 28, a great storm at Nottingham five days after the King fixed the standard there.

1649. Reported to have rained blood at Gloucester; another instance of red rain having been recorded in 1552 in the registers of the Grey Friars.

1658. September 3rd, the day of Oliver Cromwell's death—"there was such a hurricane throughout Europe that it seemed a general wreck of nature," On the northern side of this county especially many trees were uprooted or very much broken.

1671. Sept. 12, a terrible tempest; inundation at "Lyn."—*Goad.*

1662. Feb. 18, a great storm in London.

1672. July 24 and 25, it blew so hard that the lowness of the ebb in the Thames presented the sheefe before St. Mary's church above 150 paces in length.

1696. Dec. 19 and 20, news of floods in country by winds and rain; 200 sail of colliers and some coasters lost at Cromer, Norfolk.

1697. May 4, hailstones in Herefordshire 13 and 14 inches in circumference; rooks and hares killed and vast quantities of glass broken. The same storm felt around Cheshire and in Lancashire, when some of the stones weighed half a pound.

1703. Nov. 26 to Dec. 1, so disastrous as to fill a volume of the philosophical transactions with accounts of it. It was called the Great Storm, and probably surpasses all others on record. The following is an abstract of some of the accounts:—"Twelve men-of-war, with 1,300 men on board, were lost in sight of land. London alone sustained a damage of £2,000,000. In Kent 17,000 trees were uprooted. Eddystone lighthouse was destroyed. The Bishop of Bath and Wells and his wife were killed in bed in the palace. In the floods occasioned by it on the rivers Severn and Thames and coast of Holland 8,000 people lost their lives. In one district 15,000 sheep were drowned. In Kent 1,107 houses and barns were destroyed, 500 grand trees in Penshurst were

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uprooted, and 920 wherries, ships' boats and barges sunk. Tiles rose in price from 50s. to £10." De'foe says—"Horror and confusion seized upon all: no pen can describe it, no thought conceive it, no tongue can express it unless some of those who were in the extremity of it."

Dr. Isaac Watts in his diary speaks of it thus:

Friday night, Saturday morning,
The great and dreadful storm.

1740. November, a storm on the coast of England.

1745. In Yorkshire, hailstones 5 inches round.

1729. May 20, described as a hurricane.

1772. Hailstones as large as nutmegs at Leeds, in Yorkshire.

1770. August 9th, the most terrible storm of thunder add lightning occurred in Kent, known at any time or in any country. The flashes of lightning were like blazes of flame, which succeeded one another almost without interruption. Hailstones of uncommon size fell at Eltham. At Hereford, on the same day, a most violent storm from 5 a.m, to 5 p.m. At Norton Common two horses were killed; and at Bredwardine a range of buildings with much produce was destroyed. At Lewes, great storm. At Brighton the tide flowed at one motion fifty feet, which the oldest people never knew before. At Marlborough upwards of 70 sheep killed, and great losses on Salisbury Plains.

1770. December 6th, storm of wind, doing incredible damage at Liverpool, S.W. to N.W. Dublin packet foundered and all souls perished. Great inundations on the Continent—France, &c., as well as in this country—at the end of November and beginning of December. In the province of Touraine, in France, 30 bridges, 100 houses were destroyed, and 50 people killed by falling buildings.

1771. January 3rd, chimnies blown down in Hereford.

1771. August 9th, 5 p.m., violent thunderstorm in Norfolk. At this time the roads in Herefordshire, about Marden, were reported so bad as to be nearly impassable. Sept. 24th, earthquake felt in Herefordshire.

1772. February 2nd, "A tremendous hurricane" happened at Asberton, in Shropshire, between 9 and 10 a.m. A thick mist preceded it. It came from the Long Mynd mountain, accompanied by a prodigious fall of snow—levelled three houses and barns; seven people lost their lives.

Three years before occurred a hurricane in the Clee Hills.—*Hereford Journal.*

1773, May 27. Tremendous flood, caused by a violent storm. In Gloucester the water was only two feet lower than the extraordinary flood of 1770.—*Hereford Journal.*

July. Earthquake felt in Staffordshire and Shropshire.

August 21st. Leominster. "The oldest inhabitant of this town does not remember so violent a storm of wind and rain as we had last Monday afternoon. The hail, remarkably large, broke the windows.—*Hereford Journal.*

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1774, March 10th. No travelling through the county from floods, no post reaching Hereford from Leominster and Kington.

Bath, same date. "From four days successive heavy rains flood higher than ever known."—*Hereford Journal.*

1776, January 6. Tremendous snow-storm. Eight feet deep at Marlborough. Seven coaches standing between London and St. Albans on the high road. Bath coach brought in by fourteen horses; had to be dug out of the snow at Hungerford. Snow six feet deep in isle of Wight.

Hereford, January 20th. "The vast quantity of snow now on the ground has not been equalled in the memory of the oldest man." Communication from Hereford to London, either by coach or waggon, cut off for a week. The following are said to have perished in the snow or from cold:—William Griffiths, between How Caple and Sollers Hope; James Reading, near Ross; John Cither, Linton; John Charles, Garway; and another man at Marcle. "Five sheep, the property of a farmer at Winstone, Gloucestershire, dug out alive, having been in snow 27 and 21 days each, and likely to live."

At St. Swithin, near Over, Gloucestershire, a sow taken out alive after 25 days' immersion.

1778, July 31. Violent thunderstorm. Several people killed near Kington. Steeple of Trellach Church thrown down, destroying in its fall great part of the building.

December 17. Great flood in Severn.

December 31. Tremendous gale in Herefordshire, as well as rest of the Kingdom, W.S.W. to N.N.E. Houses unroofed in London without number, many noblemen's houses included.

At Cambridge many spires and battlements thrown down. Tremendous tide at Dover. 700 trees blown down in Castle Howard Park.

Many houses blown down in Scotland. This was supposed at time to have been nearly as violent as gale of 1703.—*Hereford Journal.*

1782, April 16. Portsmouth: Hurricane from S.W. Tide higher than for some years.—*Hereford Journal.*

1786, July 17. At Highbickington, Devon, 113 elm trees were uprooted and removed upwards of 200 yards, and they remained standing upright in their original flourishing state! A rock in the same place was divided upwards of eight feet asunder, and all the poultry and corn for several miles were destroyed by the thunder and lightning.—*Journal of Meteorology.* August 16. Hailstones fell as large as pigeons' eggs at North Shields.—*Journal of Meteorology.*

1787, August 9. The most awful storm of thunder and lightning all night that we have on record.—*Orlando Whistlecraft.*

1791, Oct. 25. Church, Spedhurst, Kent, destroyed by lightning, and the bells melted. Hailstones in Sussex 4 inches round.—*Journal of Meteorology.*

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1793. At Whitehaven, a storm which did great damage, the tide rising 6 feet above its usual height.—*Ibid.* Aug. 3. At Thornton, Leicestershire, hailstones fell measuring from 4 to 6½ inches in circumference.

1794, January 16. Almost universal through Britain, by which severe storms great damage was done.—*Journal of Meteorology.* Nov. A most violent storm of rain in Norfolk inundated many towns, particularly Norwich.

1797, May 6. Severe hailstorm in Surrey, Sussex, doing great damage to gardens.

1798, Nov. and Dec. Violent gales.

1797, July 30th. A thunderstorm in many parts of England, preceded by hot weather and S.E. wind, doing serious damage by hail early in the morning. —*Orlando Whistlecraft.*

1800. August 18th and 19th. Succeeding the great drought of that summer a similar storm. At Heyford, Oxon, irregular pieces of ice the size of a hen's egg fell.

The same storm did much damage in Bedfordshire, where hailstones fell 11 inches in circumference, and killed the game in the fields.

Nov. 8. Great damage done in London and almost throughout England. —*Journal Meteorology.*

1803, January 1st. A most violent whirlwind occurred at Falmouth, which stripped the roof of every house in its way. It tore up several trees, and threw a vessel lying in the harbour on her beam ends so that her keel appeared in sight.—*Ibid.*

1804, January 19. A tremendous hurricane occurred at Swansea. It came on suddenly and by the reports of the pilots was preceded by an unusual agitation of the sea.

1806, July 11th and August 19th and 20th. Thunderstorms reported as very violent in many parts of England.

1807, August. Several thunderstorms occurred.

1808, Friday July 15th. After several days of oppressive heat, the three preceding days having had a maximum shade temperature of 90, 93 and 95 respectively, culminating in one of 97°; on that day the city of Gloucester experienced a storm of thunder and lightning which extended many miles round, and exceeded in awful phenomena any one remembered for many years past. Masses of ice, of irregular shape, 3 to 9 inches in circumference fell in such quantity as to remain in heaps the next morning, destroying windows and greenhouses, with the pine apples, &c., and other plants exposed, stripping the orchards of their leaves as well as fruit killing sheep and cattle, several people being struck and one killed.

1808. Reports of damage are recorded from Somersetshire, Wiltshire, the neighbourhood of Monmouth, Tewkesbury, Upton, Tetbury, Frenchay, and Bridgnorth.—*Athenæum.*

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1809. July 6, a violent whirlwind at Cirencester, when timber trees in the park 6 to 10 feet in girth were torn completely up by the roots.—*Climate of London.*

1810. Sept. 22, a dreadful storm at Fearnal Heath, Worcestershire, which uprooted 200 trees on one farm.

1811. The summer appears to have been one of great electrical disturbance in the West-Midland district.

April 23, a violent hailstorm at Wynnstay; stones 2½ inches in circumference. 1,123 panes of glass broken in the hothouses that day completed.

April 29, hothouses at Welton perforated as if by bullets.

May 19, damage by hail and thunder beyond precedent at Sheffield.

May 20, near Newmarket terrific thunder and lightning with hailstones as large as pigeons' eggs.

May 27, Hereford. Storm to the eastward, from 3 p.m, till past 8 p.m., with torrents of rain. This storm and consequent inundation of several thousand acres of land destroyed a number of lives and much property. On the next day the Severn at Worcester rose 20 feet in 24 hours!

June 8, another terrific hailstorm at Birmingham, and also at Worcester but without the hail.

June 28, the neighbourhood of Bury was similarly visited.

July 1, at Waterford a storm as violent as was ever experienced in Ireland.

July 2, at Guildford £1,500 damage done, and the storm was very violent the same day in the vicinity of Oxford.

July 10, Llanidloes, in Montgomeryshire, and Salisbury, each had violent storms.

July 21, a violent storm at Stamford, near which town the water rose 13 feet in less than four hours.

1811. Nov. 15, an "awful" gale of wind at Whitehaven.

1812. Feb. 22 to 24, dreadful thunder storms reported at Windsor and Plymouth.

1812. March 9, Parhelia seen at Carlisle. Two mock suns having been seen from 10 a.m. to near noon.

March 20, a tremendous gale at Hull, South of Humber, from S.W. North of it, from N.E. and by E.

June 21, hail and thunderstorm in Essex.

July 29, a man dreadfully burnt by a lightning stroke in Dorsetshire.

1813. Feb. 16 to 18, very stormy weather from the West, on the Eastern and Southern coast.

May 17, very severe storms of hail and thunder at Macclesfield.

Nov. 17, spire of Bridgwater Church struck and shivered.

1814. July 28, the temperature being 91° in London, a storm, which began at 10 p.m. in the neighbourhood of Leicester, "was followed by such

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thunder and lightning as horror-struck every person in the parish. Hailstones reported bigger than hen's eggs; many window sashes beaten in; the demolition of glass excessive."—*Stamford Paper.*

Dec. 16, violent gale of wind, W. S. W. Limerick; S. E. Weymouth; S. W. Greenwich.

1816. July was unusually boisterous and wet.

Aug. 31. Accompanied by a fall of rain of nearly three inches in two days. A tremendous gale of wind visited Birmingham, Liverpool, and Manchester, and other northern towns. Much damage done to shipping, and many vessels lost at sea. This was the disastrous harvest time previously mentioned.

1816. Dec. 12th to Jan. 4th, 1817, succession of heavy gales with very heavy rains, inundating the low lands to a very great extent.

1817. Feb. 27, severe hail and thunderstorms at Glasgow and Dublin.

June 27, after ten days of great heat introduced about the solstice by S. E. winds. The vicinities of Gloucester and Tewkesbury were visited by a violent hail and thunderstorm, breaking many windows. Many sheep killed and trees blown down.

July 28, hailstorm in London, lasting seven minutes. Stones as large as hazel nuts.—"*Public Ledger.*"

Dec. 7th and 8th, hurricane from W. and N. W. at Falmouth. Felt in the Bay of Biscay the three following days. Twenty vessels destroyed on the French coast between Brest and St. Malo.

Dec. 15, another violent gale accompanied by most awful thunder and lightning.

1818. January, a succession of gales. Particularly felt at Edinburgh, where on the 14th and 15th the whole of the minarets on St. John's chapel were carried away. But perhaps the most memorable gale of this century occurred on the 4th and 5th March, 1818, which appeared to be felt over the whole of South Britain. The following particulars from the *Hereford Journal* of March 11th, may be interesting. "The terrific gale of wind on Wednesday night visited Hereford with furious violence. The upper part of one of the pinnacles of the Cathedral was blown down; also the chimnies of the King's Head inn and of Mr. Newton in the High-town. The first fell through the roof of the house carrying with it tiles, &c. A piece of lead about 20 feet by 15 feet, at Colonel Matthews, of Belmont, and weighing a ton, was rolled up and blown against a parapet wall. In all directions throughout the county trees of the largest dimensions were torn up by the roots or stripped of their finest branches, the orchards suffering severely. At Gloucester, part of the Cathedral battlements were blown down and fell through the roof near the tomb of Edward II. The Bristol and Birmingham mail with four inside and two outside passengers had a very narrow escape at Hardwicke bridge of being blown into water of great depth, and arrived at Gloucester at 7.30 on Thursday morning instead of midnight. Full particulars are given of the "miraculous escape." The

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Worcester mail was overturned at Broadway Hill, in consequence of the leaders taking fright at the hail violently blown in their faces. The abbey church at Tewkesbury suffered severely. At Monmouth the force of the hurricane was tremendous. A chimney was blown down in Mr. Pewtris's house in Monnow-street, bearing down with it a huge beam into the parlour just vacated by the inmates. The Portsmouth mail was blown over. A large elm tree near Calne blown down between two coaches at the place of meeting. In the metropolis traces of its fury were left in every street. The sight of the raging sea on the coast is described as "most sublimely terrible." The church steeple of Ash, near Sandwich, set on fire by lightning; having, however, to burn downwards, its progress was fortunately slow. The Welsh coast from Borth to Harlech was strewed with wrecks, and 140 vessels were wrecked between Calais and Helder. It was said to be the most tremendous storm ever experienced on that coast. It came from the N.W.

April 26. The eastern and south midland counties suffered from violent hail and thunder.

1819. Penzance, Jan. 17, violent W.N.W. gale.

,, 25, ,, S.W. to W.S.W. gale.

,, Feb. 21, ,, do.

October 21-22, Heavy gale from N.W., covering ground with snow to the depth of six inches.

December 21 to 28, Violent S.E. to S.W. gales.

1820. March 2, Much damage done to garden walls and buildings by a N.W. gale, with heavy snow in north.

1821. June 20, A tremendous hailstorm in Lancashire. Hailstones 3 to 4 inches round.

November 30, Hurricane at Liverpool and Manchester from westward, York suffered severely. Window, mills, and factory chimnies being levelled.

December 4, The barometer was exceedingly low from 20th to 29th, On the 24th and 25th supposed to be lower than ever recorded, viz,, 27.80 in., not accompanied however, by any particular storm in Britain; very tempestuous weather occurring far to the south of these islands.

December 27, An electric whirlwind in Hampshire, produced wonderful effects in a limited area.

1822. Sunderland, May 11, A severe gale from the E.

London, May 25, Tremendous hailstorms, choking the sewers.

London, July 5th, A violent thunderstorm.

Wolverhampton, July 31, Six cows killed by lightning.

October, A very stormy wet month. Gales on the 7th, 13th, and 24th.

December 5, caused a loss to underwriters at Liverpool of £100,000. 26 pheasants were found dead in Croome preserves; a magnificent elm tree at Raglan Castle, measuring 26 feet in girth, was blown down. Hereford and its neighbourhood was also severely visited. At Gloucester a large proportion of

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the houses were more or less damaged. Twenty dwelling houses in Charlton were blown down; tiles and slates swept from the roofs of houses at Worcester; the Holyhead mail upset. It lasted 10 hours, and came from S.W. A poor man was found dead in a ditch at Wellington, Herefordshire, having been blown there, and unable to extricate himself.

1823. February 20 to 23, violent westerly gales on the coast of Cornwall.

October 30, 31, A sudden storm, causing immense inundations at Bath and Oxford.

December 3, A violent thunderstorm at Gloucester; a steeple struck at Remalo, Wiltshire.

1824. March 4, A heavy gale from N. and W.

1824. July 14 and September 17, tremendous thunderstorms over the South of England.

1824. November 23, a violent gale from W. and S.W., preventing intercourse with France. Stones of seven and eight tons were displaced at the Plymouth Breakwater. It was said to be scarcely inferior in violence to that of March, 1818.

1828. January 13, scarcely a house in Plymouth escaped injury; 13 vessels on shore at the same time, and all lost.

1828. July 3, the most severe thunderstorm since 1821, specially in Sussex and Hampshire.

1819. June 17, a globular mass of electric fluid about the size of a cricket ball and crimson red entered the New Inn between Raglan and Monmouth at an open back door passing through the kitchen along a passage and out at the front door. Mr. and Mrs. Jones, of Raglan, and Mr. Young, of Cwm Carvon, were sheltering at the time.

1829. September 8 to 11, not less than 27 losses were posted at Lloyd's.

1829. September 15, a severe thunderstorm burst over Lambeth.

1831. October 26, a tremendous storm at Swansea nearly destroyed a gentleman's house.

1833-34. In this winter there was such a succession of gales that 100,000 tons of shipping were supposed to be lost.

1834. October 18, great damage done on the British coasts.

1836. November 29, the most violent storm since 1818 from W. and W.N.W. Windmills, tops of steeples, and chimney stacks were demolished; whole rows of trees uprooted.

1839. January 7, as bad as the last and more general. 200 lives lost at sea; 177 houses blown down in Ireland.

1840. January 21, a severe storm, but not quite so violent as the last.

1845. Hailstorm, doing great damage at Everston, near Ross, for which a public collection was made throughout the county.

1843. A destructive storm in eastern counties.

1846. A terrific thunderstorm, after a season of scorching heat.

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1850. February 6, a gale from N.W.

1852. July, Ross steeple struck during a violent storm. Woolpit spire was destroyed by probably the same storm.

1853. July 7, a very violent storm, from 1 to 4 a.m., at Ross.

1854. August 10, a school-house struck and burnt down near Ipswich.

1857. August 13, torrents of rain and violent thunderstorm at Ross.

1858. Same day, a very violent storm at Ross, but extending not many miles. 2.45in. in rain in 50 minutes.

1859. Oct. 25, Royal Charter gale
1860. Feb. 28, quite as severe
May 28, again nearly so
} This period was remarkable for its extraordinary gales, of which these three are only the most violent.

1861. February 21, very similar to the 28th of last year.

1866. January, proved a succession of gales.

To conclude, it thus appears that the periods from December 15 to the first week in January; from about the 20th February to March 10; and from October 25 to November 22; are the times of the year the most productive of gales of wind: that the most destructive hailstorms occur in May; and the most violent thunderstorms from July 12 to August 12. Winter storms, however, when severe often do great damage.

Many remarks might be made and further conclusions be drawn from a study of these records, but the length of this paper forbids longer comment.

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SCLERODERMA GEASTER, Fr., A NEW BRITISH FUNGUS.

BY C. E. BROOME, ESQ., F.L.S.

Micheli was the first to distinguish *Scleroderma Geaster*, Fr., in his 'Nova Genera Plantarum,' p. 219 t. 99, fig. 1, where he published it has a distinct species under the name of *Lycoperdastrum rotundum majus*. After that it appears to have been passed over by botanical writers till Persoon took it up and designated the genus *Scleroderma*, from its hard integument; his specific name for our plant, *polyrhizum*, seems to have been less suitable, as it applies equally to others of the genus.

Fries in his 'Systema Mycologicum, iii. 46, named the species more appropriately *S. Geaster*, on account of its resemblance to the plants of that genus. In his monograph of the *Lycoperdaceæ*, Vittadina remarks that the species of *Sclero. derma* are few, but so variable in character that they are only to be recognized after a long acquaintance. The differences in the colour of their peridia, the size and form of the uterus, and the presence or absence of a stem, he considers of little moment, nor are those consisting in the colour of the flesh and spores much more reliable, for the same species exhibits these of various tints, according to differences of soil and atmosphere; much depends on the slowness or rapidity of developement, which are manifestly connected with climate and temperature. He places more reliance on a careful comparison of specimens from different localities, and collected under various atmospheric conditions, combined with careful microscopical study of fructification. The greater number of the so-called species the Italian botanist refers to *S. vulgare*, F., *S. Geaster* being the only other with which he is acquainted which he thinks worthy of specific rank. He describes it as possesing a very thick peridium splitting at the apex in a stellate manner, with a smooth, somewhat furfuraceous cortex, of a yellowish-grey colour. The flesh black or brown-purple, and the spores olive-brown.

Vittadini describes two varieties, the first is emergent, sessile, globose, or transversely elongated; flesh at first watery-white, then black, variegated with white walls. The inner substance of the peridium, when recent, whitish-yellow; when dry, of a pale woody tint, rather corky; in the young condition, when dry, strongly plicate-rugose, with black flesh almost stony in consistence, shining when rubbed. This is frequent near Milan in oak and pine groves in autumn. The second variety is developed beneath the soil, substipitate, pear-shaped, 2—5 inches across; peridium 2—3 lines thick, purplish-white within, clothed with scales mixed with sand, and of a permenant yellow colour, scarcely rugose when dry; flesh at first watery, white, hard, at length a dirty purple colour, soft, varie-

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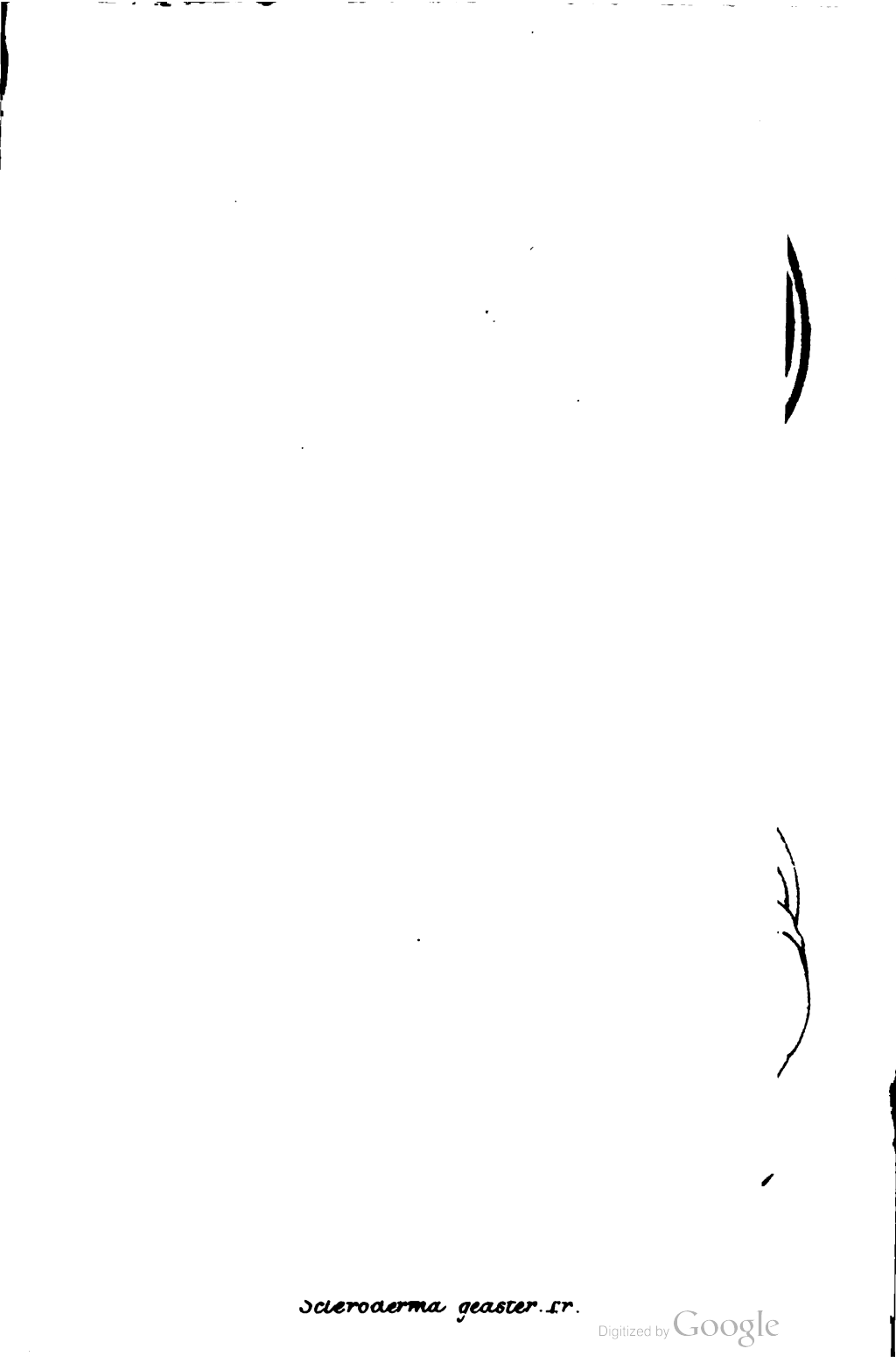

Sclerodaerma geaster. Fr.

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W G. Smith, F.L.S. del et lith

W West & C° imp.

Scleroderma geaster. Fr.

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gated with white flocci. He adds that he long considered these varieties as distinct species, relying on Fries, who thought their characters permanent; but afterwards on seeing *S. Geaster* in various localities and soils, he found that the one form evidently passed over into the other, the flesh assuming every tint between black and blueish-purple.

The species is distinguished from the rest of the genus by the singular thickness of its peridium, and the smoothness of its bark, but especially by the stellate mode of the dehiscence of the peridium.

Fries gives Southern Europe and Carolina as its localities; to these may be added La Calle, in Algeria, as Montague informs us in the 'Flore d'Algeria,' and Australia, Drummond, n. 168, A comparison of the spores of the British plant with those of specimens from Carolina exhibits scarcely any difference, both being rough and varying from 0·0003 to 0·0005 inch diameter.

EXPLANATION OF PLATE.—Fig. 1, 2, 3. *Scleroderma Geaster*, Fr., from specimens collected by Dr. Bull, at Hagley, near Hereford, in Oct. 1870. (See page 162.)

Fig. 4 Spores magnified 700 diameters.

REPORT OF THE HEREFORD MAPPA MUNDI.

BY THE REV. F. T. HAVERGAL, M.A.

Since the last annual meeting of this Club the reproduction of this work has been carried on with slow but steady efforts. One-third part of the *fac simile* was completed in September last, and the whole would have been finished before the present time had not the lamentable war broken out on the Continent. Should peace be proclaimed in a short time, the remainder of the *fac simile* could be completed within three or four months, as the whole of the lithographic stones are in a forward state. The principal artist engaged in producing the first section of our map was killed at Sedan, and the lithographer has suffered terribly by the loss of his workmen at Bruges and the bombardment of his other establishment in Paris. The editors of the volume of descriptive letter-press have in the meantime been pursuing their difficult task, so that they will in due time present a full and learned account of all the legends and places mentioned in the map. The undertaking has not received a very liberal support, only 50 or 60 copies having been secured by subscribers—those chiefly connected with this county. There are doubtless many persons who prefer seeing this work complete before making such an investment. Subscribers will secure decided advantages, as, after publication, the price will be raised. It is

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gratifying to find that this undertaking is regarded with considerable interest in literary circles; not only will the Hereford Mappa Mundi find a place in the mansions of the rich, but in many public and free libraries in our large towns will this work also be found. The promoters feel confident that within another year they will complete the publication in the most satisfactory manner (applause).

Two sections of the map, representing the half of it, in full size, *fac simile*, were exhibited to the meeting, and were much approved.

RARE BIRDS.

BY MR. JAMES W. LLOYD, OF KINGTON.

The following rare birds were exhibited to the meeting:

PHALAROPUS LOBATUS, the Grey Phalarope, two specimens that were shot at Bexhill, near St. Leonards-on-Sea, Sussex, Sept. 19th, 1866. During the autumn of that year an unusual number of these pretty birds visited this country, especially the southern counties. It is recorded that no less than 225 specimens were shot during the month of September. The cause of this great influx is supposed to have been the severe gales which prevailed during that month, when icebergs came further south than had ever been known before. A few instances of their occurrence in inland counties is recorded, one being in our own neighbourhood, a specimen having been shot by the gamekeeper of W. de Winton, Esq., on his grouse moors in Radnorshire. The bird was swimming and diving in an artificial dam near some dwelling-houses.

STURNUS LUDOVICIANUS, Linn. (*Alauda magna*, Wilson) the American Meadow Starling, or, as it is more commonly called, "Meadow Lark." This interesting bird was killed by a man when snipe shooting close to the town of Cheltenham, about the year 1840, when it rose from a boggy place. According to the Editor of *The Field* it is one of only three instances in which this bird is known to have appeared in England, and the first—for the others are recorded by Mr. P. L. Sclater in *The Ibis* for 1861, one being killed at Thrandeston, in Suffolk, and the other at Walsham, in Norfolk.

This bird is a very well known species in the United States and Canada, where it is called the "Meadow Lark," from its resemblance to a lark in its actions and habits. It has, however, nothing to do with this family of birds, but is an aberrant form of the Icteridæ or hang nests; its structure being modified to adapt it for terrestrial habits. It is a curious compound of many widely different families. With the bill and feet of a starling, it has the rounded

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wings of a gallinaceous bird, and rises with the same whirring sound; the dorsal feathers are those of a hemipode; the wing coverts, tertiaries, and tail, those of a snipe or sandpiper; while the colouring of the underparts (yellow, with black pectoral band) is much like that of Macronyx, a remarkable African genus of gigantic pipits. Lastly, there is sufficient of the lark about it in appearance and actions when seen alive, to have suggested its popular name of "Meadow Lark" among the Anglo-Americans.

There is scarcely a market day in Philadelphia from September to March but they may be found offered for sale, being considered for size and delicacy little inferior to the quail, and they are valued accordingly. In South Carolina and Georgia they swarm during the winter among the rice plantations, running about the yards and outhouses, as if domesticated.

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HEREFORDSHIRE LEPIDOPTERA IN THE NEIGHBOURHOOD OF LEOMINSTER.

BY THE FAMILY OF THE REV. THOMAS HUTCHINSON, M.A.

We have at last found time to draw out a list of the Lepidoptera we have found in the county since your list was published in 1866.

The number of newly found species is not large, but those recorded you may rely upon.

A few are of great rarity, and we have reason to consider the last two seasons as more than commonly good. Many of those recorded before, of which, only single specimens had then been taken, have been again captured in fine condition. In 1866 I informed you of the capture of *Eupithecia consignata*, and can now, with pleasure, record that, since we have been able to place specimens in the collections of many friends, and other noted Entomologists, having reared many splendid moths from the ova. We have also captured several other species of *Eupithecia*, amongst them, the very rare *irriguata*, and, if spared to see it appear again, we trust to procure ova of this lovely little moth. We hope the food has been discovered, as last year we found a larva on oak, which we instantly sent to one of our first authorities, and he agrees with us in considering it will prove to be that of *irriguata*; it is now in pupa and may be expected to emerge in April. I also mentioned, in 1866, that my eldest son had taken a larvæ of *Dicranura bicuspis*, at Dinmore—the moth never emerged; but last May, he captured, nearly on the same spot, a noble female moth of that species, newly emerged from cocoon and resting upon it. The cocoon was attached to a birch trunk.

Sterrha sacraria, another very rare and beautiful species, was taken at night, attracted by a candle burning in the kitchen May, 1867.

The grand Hawk-moth, *Deilephila Galii*, was taken by my son, flying over a petunia bed last August.

Notodonta dictæoides. We have taken the three last years in the ova and larval stages, and we had the satisfaction of rearing a very fine series.

A lovely specimen of *Cymatophora ridens* was taken by my second girl, a larva of *Acronycta tridens* by my second boy, who also had the good fortune to take a fine example of *Colias hyale* in 1868, when this usually scarce south-coast butterfly was taken in some numbers in many parts of the kingdom. It may interest you to learn that during last season I set 1026 butterflies and

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moths, reared mostly from the egg; of course most of these were fed in 1869, and were in pupa during the winter; at this time I must have above 1,000 pupa which I fed during 1870, and which I trust will emerge this season.

I had the good fortune to carry the larva of *Erebia blandina* through the winter of 1869-70, having reared them from eggs sent me from Scotland, and thus I enabled Mr. Buckler to figure the larva for his long looked for work. I had also the good fortune to procure ova from some hybernated *Xylina petrificata* and *semi-brunnea*, taken by my sons at Sallowbloom, and rearing the larva and having them figured prove them to be distinct species.

My two eldest sons made an entomological trip to the Highlands last summer, and were most successful, taking a number of good moths, amongst others four specimens of *Noctua sobrina!* a larger number of this great rarity than I can hear of being ever taken by any collector before.

Two friends have been yearly trying for them; one Mr. Buchanan White, of Perth, who resides within 30 miles of Camachgouran, where they were all taken, and yet such has been his want of success that he has never seen one; but I hope now the exact locality is known it will reward others to visit the spot next year.

DIURNI.

Colias hyale

NOCTURNI.

Deilephila galii
Lithosia complana
Liparis salicis
,, monacha

GEOMETRÆ.

Ennonos erosaria
Ephyra porata
,, trilinearia
,, omicronaria
Acidalia incanaria
Sterrha sacraria
Hybernia aurantiaria
Larentia olivata
Eupithecia linariata
,, lariciata
,, pulchellata
,, plumbeolata
,, albipunctata
,, irrignata
Eupithecia tenuiata
Thera firmata
Melanthia albicillata
Camptogramma fluviata
Phibalapteryx tersata
,, vitalbata
Scotosia vetulata

DREPANULÆ.

Platypteryx unguicula

PSEUDO-BOMBYCES.

Dicranura bicuspis
Notodonta dictæoides

NOCTUÆ.

Cymatophora diluta
,, ridens
Acronycta tridens
Cerigo cytherea
Luperina testacea
Miana fasciuncula
Rusina tenebrosa
Agrotis saucia
,, nigricans
,, obelisca
Triphena fimbria
Anchoclis lunosa
Hoporina croceago
Xanthia citrago
Cirrœdia cerampelina
Tethea retusa
Dianthœcia carpophaga
Aplecta tincta
Cucullia chamomillæ
Heliothis marginata

PYRALIDES.

Pyrausta ostrinalis
Crambus pinetellus
Crambus geniculellus
Ephestia penguedinella

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TORTRICES.

Tortrix cratægana
Peronea ferrugana
,, aspersana
Penthina picana
,, pruniana
Spilonota suffusana
Sericoris latifasciana
Orthotænia striana
Grapholita penkleriana
Phlæodes immundana
Batodes augustiorana
Pœdisca profundana
Ephippiphora signatana
Retinia pinivorana
Carpocapsa pomonana
Stigmonota perlepidana
Stigmonota regiana
Catoptria juliana
,, scopoliana
,, Hohenwarthiana
Cochylis inopiana

PTEROPHORI.

Pterophorus lithodactylus

TINEÆ.

Micropteryx subpurpurella
Depressaria ciliella
Gelechia luculella
,, leucatella
Ocophora pseudo-spretella
Gracilaria swederella

NOTES ON LEPIDOPTERA FOUND AT WHITFIELD FROM JULY 1869 TO DECEMBER 1870.

BY MR. F. E. HARMAN, M.R.A.C.

GENTLEMEN,—In introducing to your notice a subject like the present, I must be excused if the contents of this paper merit the titles of wearisome and uninteresting.

A mere list of species—and this paper contains little else—must always be so, and one on a subject to which the Club has hitherto paid but little attention cannot escape the censure.

I trust at some future time, when Botany and Geology are thoroughly worked out, more members of the Club may turn their attention to the Lepidoptera of the county. A rich field awaits their inspection, and it has the advantage of being almost unknown. Except the district of Leominster no part of the county has—as far as I am aware—received more than a cursory examination, but the results there are sufficient to prove Herefordshire rich in Lepidoptera, and including many rarities.

To the geologist the relations between the soil, and the selection of the food plant by the insect, presents a wide field for experimental inquiry, and deserve careful study.

I was particularly struck last year with these relations—at present so obscure—when searching some Beech trees growing on a poor but deep marl soil near here.

Not a single larva of even the commonest species would fall to the strokes of the beating stick, but no sooner did I turn my attention to Oak than they fell fast and thick.

On a former collecting ground on the Oolite, Beech was by far the more

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productive tree, and but few species could be secured from Oak either by beating or pupa-digging.

The only insect I have obtained here from Beech is *Liparis monacha*—a single larva—and in this instance it was feeding on a tree near a corn-stone lime quarry.

Neither Elm or Poplar yield many larvæ where growing near the outcrop of this stone, but on a deep soil their usual frequenters will be found. Elm and especially Wych Elm is scarce here, yet the local *Xanthia gilvago*, believed to feed especially on Wych catkins, has been taken.

Oak at all seasons yields the greatest number of larvæ. What theories have been accepted on this subject I am unable to say. It may be that some chemical product is formed in leaves, growing on their natural soil, that is essential to the well being of the larva, and instinct leads the female moth to select such trees when depositing her ova.

It cannot be a mere chance that larvæ which on the Oolite Limestones feed almost exclusively on Beech, on the Old Red Sandstone resort entirely to the Oak.

The number of named Lepidoptera found at Whitfield is, from the short and imperfect way they have been worked, by no means insignificant. They number nearly three hundred species, and several, as far as I am able to discover, are entirely new to the county.

The *Diurni* which from their showy appearance and time of flight are most often noticed, number about 30 species.

First to be mentioned is *Leucophasia sinapis* which seems not so scarce as at Leominster; one I took in August was flying over a cornfield in company with the commoner *Picris rapæ*, an unusual locality for this wood-frequenting species. *Argynnis paphia*, is abundant sailing up and down every sunny path in the woods, stopping ever and anon to sip the nectar from the blackberry blossoms, tenanted by numberless examples of the commoner species of *Hipparchia*.

The elegant *Thecla quercus* sports in plenty around every oak and is the only Hair-streak at present taken. I believe *Thecla W. Album* occurs as I once knocked an insect resembling it into a hedge, but being unable to find it cannot speak positively.

Of the Hawk-moths no rarity has been taken here.

Deilephila galii, not hitherto known to the county, appeared at Leominster last summer for the first time.

The destructive internal feeders, fortunately seem scarce, and will, I trust, continue so. *Sesia apiformis* and *Zuzera æsculi* are at present the only representatives.

The usually common Goat-moth *Cossus ligniperda* which, in some districts does such extensive damage in the larva state, by boring through the solid wood of our forest trees, has failed to make its presence known, either by the holes it

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bores or the smell—aptly compared to a goat—which it emits from its livid red and yellow skin.

The pretty little *Calligena miniata* is not uncommon and is one of the additions to the county list.

Liparis monacha, often rather a scarce species, cannot be called so here, as I have taken over 20 specimens in 2 hours at rest, chiefly on oak where the trees were growing thickly and free from underwood.

This insect when at rest closely resembles the lichens growing on oak trunks, and for that reason selects that tree as a hiding place.

The females, as is the case with the entire family, are far less volatile than the males, and make not the slightest attempt to escape when captured.

I was fortunate in meeting with another species of the same genus, *Liparis chrysorrhœa*, and this, I believe, has not been taken in Herefordshire before.

Of the *Geometræ* many good species occur. *Prunaria extersaria* and *cytisaria* appear to be new, but all are scarce here.

The showy *Abraxas ulmata*, common beyond Pontrilas and between that station and Pandy, where its food plant, the Wych Elm, grows freely, is unfortunately just outside my hunting ground, and from its sluggish habits is not likely to extend its locality.

The entire genus *Hybernia* occurs, *Leucophearia* exhibiting some striking varieties in the males. The females, being wingless, are not able to show any pecularities of marking.

The *Eupithecie* have at present received little attention. *E. rectangu'ata* abounds in all our orchards, frequently as many as a dozen specimens may be found on a single tree.

Of the rare *Dicranura bicuspis* I have found several empty cocoons, generally on Birch, but once on Alder, and the other species of this pretty genus have left marks of their presence on their respective food plants, though by no means freely. Scarce as they are, their numbers seem greatly on the decrease.

The egg laid as it is, on the upper side of a leaf, and perfectly exposed, often falls a prey to insectiverous birds, and should it escape these foes and the larvæ hatch and flourish, greedy Ichneumons seem ever on the watch to lay an egg or eggs on their hapless victim, and by slowly devouring all but his vitals, to flourish, and produce another race of parasites to continue their revolting ravages on future generation of harmless and helpless larvæ. If the larvæ escape these dangers, they form hard, horny water-tight cocoons—not unlike half a walnut shell in shape or texture—on the back of the tree they feed on, or if that be too small, they descend it and construct their winter retreats on a neighbouring trunk, so that although the cocoon of *Dicranura vinula* may be found on oak, it by no means proves the larva to have fed on that tree, and a moment's search will show dwarf-aspen at no great distance, and this will have been the real food plant.

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When ensconced in their cocoons, all danger would seem at an end, but, unfortunately, Woodpeckers consider larvæ most tempting morsels, and a few blows of their powerful bills soon make an end of both cocoon and contents.

I may mention that along the banks of the Wye below Hereford *Dicranura bifida* appears to be rather common, but their cocoons when full require a very sharp and well-tutored eye to distinguish them from a mere roughening of the bark of the poplar they are formed on.

It is with great pleasure I can place *Stauropus fagi* on my list. Three of their larvæ, the most singular of all, the *cuspidates*, from their remote resemblance to lobsters, were captured in 1869.

Rarities often turn up in most unlikely places, and one of these was found crawling about in the bottom of a boat.

It was then full fed, and had no doubt fallen from an overhanging oak bough, and but for the boat would have met with a watery grave.

The other two larvæ were beaten from young oak trees growing thickly together.

Stauropus fagi is supposed to spin up in a leaf while it is attached to the tree, and descend in it when the leaves fall in the autumn. In this case all the larvæ descended in the usual way when full fed, and wandered about on the earth in my breeding cage for a considerable time. They then crawled under leaves, and making a sort of tent, spun a loose cocoon, using any materials at hand for the under part, and the leaves for the upper.

Petasia cassinia, a scarce species, is not uncommon here, and may be found at rest on apple trees in our orchards about the first week in November. The males may also be obtained freely at light. *Capinea* is a most difficult species to rear, and I find all my correspondents who have tried rearing it fail as miserably as I do. Of some thirty larvæ bred last spring I did not get a single imago, yet all fed up well and entered the earth apparently in first-rate condition. No reason is at present known for this enormous fatality whilst in the pupa state, and it makes no difference whether the larvæ have been bred in captivity or have remained in their wild and unpampered condition. I assert this from the fact of the larvæ being found far more commonly than the imago.

Of the genus Notodonta three species at present occur, the rarest of these, *Notodonta trepida*, bred from pupæ found at oak roots, seems somewhat darker in colour than species from other parts of England, a circumstance observed in several insects in this county.

Passing on to the Noctuæ, my list becomes very limited, but the absence of extensive marshes, heaths, and waste lands prevent this order being even fairly up to the average in point of numbers.

The pretty *Thyatiræ* are both common, and a lovely sight it is to see these insects sipping sugar on a dark June night when the flash of a "bull's eye" enables every mark to be seen distinctly on their quivering wings, and

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the dark coloured back shows off their delicate markings to a much greater advantage than the white paper and methodical rows in a cabinet.

The genus *Acronycta* is well represented, and of its rarest species *Acronycta alni* I have met with a single larva.

When first taken it had not changed its skin for the last time, and much resembled a piece of sparrow's dung, the better to escape the sharp eyes of birds. The only characteristic it had then attained was the clubbed hairs, and these were few in number and very indistinct. In confinement it fed on the upper side of the leaf, choosing those half-way up a shoot of Alder in preference, but sometimes taking a nibble at Oak and Birch. It grew rapidly, and drank an unusually large quantity of water, was very sluggish, and after changing its coat for the last time rolled off its food with the greatest readiness.

Unlike the *Dicranura* larva it spun no pad of silk to secure its foothold on the centre and upper side of the leaf it selected for a resting place. When full fed it made a cocoon in a cork, rapidly excavating it to the depth of nearly an inch, and roughly lining the cell so formed with a slight coating of silk.

The pupa differed from some others of the genus, being of a rather bright reddish black, shining, pointed at the tail, all the segments fully extended, and was lively when touched, much more so than the pupæ of *Noctuæ* usually are.

This insect, though exceedingly rare all over England, seems commonest in the larva state.

It is considered a difficult species to rear, and I think the want of moisture in our breeding cages may be one of the chief reasons why so few of its larvæ turn properly.

I have never found water injurious to larvæ, whether given by wetting the food, or allowing the dew to be on the leaves. Much has been written to prove moisture fatal, but how do the insects manage in rainy weather?

They cannot do without eating for long at a time, and to crawl all over a tree in search of a dry leaf would be beyond the power of the most active caterpillar.

From experiments I have made, I find larvæ which often seem at the point of death revive wonderfully when emersed in water for a few seconds, and allowed afterwards to imbibe as much as they choose.

The rapid expansion, assisted by the softening influence of the bath, causes their then tightly-fitting skins to crack, and a few energetic wrigglings are sufficient to disentangle their worn out suits, which, if left alone, might have been for days still on their backs, till they had wasted away to miserable masses of skin, instead of being half-way on to another stage of coat-changing.

The extensive family, the *Leucanidæ*, are only represented by the commonest species, as it is a family chiefly found in districts where extensive marshes abound.

The genus *Agrostis* is also sparingly represented, but in it one new species *Agrostis rota* occurs.

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The pretty *Tæniocampa miniosa* is not uncommon, and is accompanied in its feasts on the Sallow Catkins by all the other species of the genus but the local *Opima* and *Leucographa*.

Ivy blossom, the last great enticement of the year, has yielded several of the rarer autumnal insects, and sugar adds *Herbida* to our lists. The only other *Noctua* I believe to be new is *Hecatera serena*, of which only a single specimen has been taken.

The following is a list of the species met with during a year and a half's collecting, and though very imperfect is sufficient to show the district to be one of quite average merit, and I hope deserving, like the rest of the county, of more attention to its Lepidoptera than it has hitherto received :—

DIURNI.

LEUCOPHASIA
  Sinapis
PIERIS
  Brassicæ
  Rapæ
  Napi
ANTHOCHARIS
  Cardamines
GONEPTERYX
  Rhamni
COLIAS
  Edusa
ARGYNNIS
  Paphia
  Euphrosyne
VANESSA
  C-album
  Urticæ
  Polychloris
  Io
  Atalanta
  Cardui
SATYRUS
  Egeria
  Megæra
  Janira
  Tithonus
  Hyperanthus
CHORTOBIUS
  Pamphilus
THECLA
  Quercus
POLYOMMATUS
  Phlæas
LYCÆNA
  Alexis
  Argiolus
SYRICHTHUS
  Alveolus
THANAOS
  Tages
HESPERIA
  Sylvanus
  Linea

NOCTURNI.

SMERINTHUS
  Ocellatus
  Tiliæ
SPHINX
  Ligustri
CHŒROCAMPA
  Porcellus
  Elpenor
MACROGLOSSA
  Stellatarum
SESIA
  Apiformis
HEPIALUS
  Lupulinus
  Humuli
ZYGÆNA
  Filipendulæ
NOLA
  Cucullatella
NUDARIA
  Mundana
CALLIGENIA
  Miniata
LITHOSIA
  Complanula
  Griseola
CHELONIA
  Caja
ARCTIA
  Menthastri
LIPARIS
  Chrysorrhœa
  Aurifiua
  Monacha
ORGYIA
  Pudibunda
  Antiqua
DEMAS
  Coryli
TRICHIURA
  Crataegi
PŒCILOCAMPA
  Populi
ERIOGASTER
  Lanestris
BOMBYX
  Neustria
  Quercus
ODONESTIS
  Potatoria
SATURNIA
  Carpini

GEOMETRÆ.

UROPTERYX
  Sambucata
EPIONE
  Apiciaria
RUMIA
  Crataegata
ANGERONA
  Prunaria
METROCAMPA
  Margaritata
ELLOPIA
  Fasciaria
EURYMENE
  Dolabraria
PERICALLIA
  Syringaria
SELENIA
  Illunaria
ODONTOPERA
  Bidentata
CROCALLIS
  Elinguaria
ENNOMOS
  Erosaria

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GEOMETRÆ Continued.

ENNOMOS
Angularia
HIMERA
Pennaria
PHIGALIA
Pilosaria
AMPHIDASIS
Prodromaria
Betularia
HEMEROPHILA
Abruptaria
CLEORA
Lichenaria
BOARMIA
Repandata
Rhomboidaria
TEPHROSIA
Extersaria
PSEUDOPTERPNA
Cytisaria
IODIS
Lactearia
HEMITHEA
Thymiaria
EPHYRA
Porata
Punctaria
Omicronaria
Pendularia
ASTHENA
Luteata
Candidata
ACIDALIA
Scutulata
Bisetata
Remutata
Imitaria
Aversata
TIMANDRA
Amataria
CABERA
Pusaria
Exanthemaria
PANAGRA
Petaria
NUMERIA
Pulveraria
FIDONIA
Piniaria
MINOA
Euphorbiata
ABRAXAS
Grossulariata
LIGDIA
Adustata
LOMASPILIS
Marginata
HYBERNIA
Rupicapraria
Leucophearia
Aurantiaria
Progemmaria
Defoliaria
ANISOPTERYX
Æscularia
CHEIMATOBIA
Brumata
OPORABIA
Dilutata
LARENTIA
Didymata
Pectinitaria
EMMELESIA
Alchemillata
Albulata
EUPITHECIA
Vulgata
Abbreviata
Exiguata
Coronata
Rectangulata
LOBOPHORA
Hexapterata
THERA
Variata
YPSIPETES
Elutata
MELANTHIA
Rubiginata
Ocellata
Albicillata
MELANIPPE
Subtristata
Montanata
Galiata
Fluctuata
ANTICLEA
Rubidata
Badiata
Derivata
COREMIA
Ferrugata
Unidentaria
CAMPTOGRAMMA
Bilineata
Fluviata
SCOTOSIA
Dubitata
CIDARIA
Psittacata
Miata
Corylata
Russata
Immanata
Suffumata
Silaceata
Fulvata
Pyriliata
EUBOLIA
Cervinaria
ANAITIS
Plagiata

DREPANULÆ.

PLATYPTERYX
Hamula
CILIX
Spinula

PSEUDO-BOMBYCES.

DICRANURA
Vinula
STAUROPUS
Fagi
PETASIA
Cassinea
PYGÆRA
Bucephala
PTILODONTIS
Palpina
NOTODONTA
Camelina
Zicsac
Trepida
DILOBA
Cæruleocephala

NOCTUÆ.

THYATIRA
Derasa
Batis
CYMATOPHORA
Duplaris
Diluta
Rideata
ACRONYCTA
Tridens
Psi
Leporina
Megacephala
Alni
Ligustri
Rumicis
LEUCANIA
Lithargyria
Comma
Impura
Pallens

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NOCTUÆ Continued.

HYDRÆCIA
Nictitans
AXYLIA
Putris
XYLOPHASIA
Polyodon
Hepatica
CERIGO
Cytherea
APAMEA
Oculea
MIANA
Strigilis
Literosa
Furuncula
Arcuosa
GRAMMESIA
Trilinea
CARADRINA
Alsines
Blanda
RUSINA
Tenebrosa
AGROTIS
Puta
Suffusa
Saucia
Segetum
Exclamationis
TRIPHÆNA
Janthina
Fimbria
Interjecta
Orbona
Pronuba
NOCTUA
Augur
Plecta
C-Nigrum
Triangulum
Brunnea
Festiva
Rubi
Baja
Xanthographa
TÆNIOCAMPA
Gothica
Rubricosa
Instabilis
Populeti
Stabilis
Gracilis
Miniosa
Munda
Cruda
ORTHOSIA
Ypsilon
Lota
Macilenta
ANCHOCELIS
Pistacina
Lunosa
Litura
CERASTIS
Vaccinii
Spadicea
SCOPELOSOMA
Satellitia
XANTHIA
Cerago
Aurago
Gilvago
Ferruginea
CIRRHOEDIA
Xerampelina
TETHEA
Subtusa
COSMIA
Trapezina
Diffinis
Affinis
DIANTHÆCIA
Capsincola
HECATERA
Serena
MISELIA
Oxyacanthæ
AGRIOPIS
Aprilina
PHLOGOPHORA
Meticulosa
EUPLEXIA
Lucipara
APLECTA
Herbida
Nebulosa
HADENA
Protea
Dentina
Genistæ
XYLOCAMPA
Lithorisa
CALOCAMPA
Vetusta
Exoleta
XYLINA
Rhizolitha
Semibrunnea
Petrificata
BREPHOS
Parthenias
Notha
ABROSTOLA
Urticæ
PLUSIA
Iota
Gamma
GONOPTERA
Libatrix
AMPHIPYRA
Pyramidea
Tragopogonis
MANIA
Maura
CATOCALA
Nupta
EUCLIDIA
Mi
Glyphica
PHYTOMETRA
Ænea

AVENTIÆ.

AVENTIA
Flexula

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On the remains of a giant Isopod *Prærcturus gigas*, (H. Woodward) from the Old Red Sandstone of Rowlestone Quarry, Herefordshire.

By Henry Woodward, F.G.S., F.Z.S., of the British Museum.

During the Meeting of the British Association at Exeter, in August, 1869, Dr. Mc Cullough, of Abergavenny, exhibited some portions of a most remarkable fossil from the Cornstones of Rowlestone, Herefordshire, which (after a cursory examination) I ventured to state were,—I believed—parts of a species of *Stylonurus*, equal in size to the great *Stylonurus Scoticus*, from the Old Red of Forfarshire (described by me in the Quart. Journ. Geol. Soc. Lond., 1865., Vol., xxi. p. 484. Pl. xiii.]

Last year Dr. Mc Cullough was so kind as to send the fossil remains in question up to London, with the request that I would examine the same and report upon them to the Woolhope Club.

The fossil-remains about to be described are delineated by Dr. Bull, with his accustomed fidelity, in the accompanying Sketches Nos. 9 and 10.

Sketch No. 9 represents the dorsal and ventral aspects of what is evidently the body-segment of a large Crustacean, having its upper surface (Fig. 1 A.) ornamented with tubercles and exhibiting along its most perfectly preserved anterior border *(a)* the smooth rounded margin which was inserted beneath the next preceding segment, of which however no trace remains.

The underside (Fig. 1 B) exhibits the basal joints of what were probably a pair of ambulatory or natatory feet *(n, n,)* belonging to the segment seen in Fig. 1 A.; whilst the remains of a second and exactly similar pair *(o, o,)* once attached to a lost posterior segment, can also be readily made out.

In Sketch No. 10 is represented three other remains, obtained with the preceding, and evidently parts of Crustacean appendages; being moreover ornamented in a similar manner to the dorsal surface of the segment in Sketch 9, they may with propriety be referred to the same animal.

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Placed beside the cast of the great *Stylonurus Scoticus*,* it did not require a very protracted examination or comparison to demonstrate most clearly that the Rowlestone fossil had no relation to that genus; but this point arrived at, I found myself for some time quite unable to decide what its real affinities were.

The ornamentation of the dorsal surface differs greatly when compared with *Stylonurus Scoticus*.

Assuming it to have belonged to that species, as I at first supposed, it could only have been one of the abdominal segments.

The dorsal surface of these in *Stylonurus* is covered with minute scale-markings, whilst a row of pear-shaped tubercles borders the posterior margin of each segment.

These abdominal segments moreover are furnished, in *Stylonurus Scoticus*, with large epimeral pieces increasing in size as the segments diminish in breadth backwards to the telson. Lastly, they are destitute of appendages of any kind.

In the Rowlestone specimen (Sketch No. 9, Fig. 1. A.) the dorsal surface of the segment is almost covered with prominent rounded tubercles disposed irregularly over its surface, a fine median line is also seen dividing the segment down the centre into two equal parts. From this line, near the middle of the segment, a transverse depression spreads out on either side destitute of tubercles but marked on either hand by a smooth rounded depression, about the size of a pea, and ⅔ths of an inch from the median line.

The anterior border, which is rounded, and, as it were, bevelled off. is quite smooth for 1½ inches, save that it is marked by a slightly raised transverse line or ridge which crosses it at *l*, *l*, and by two small sub-central depressions.

This is evidently the portion of the segment which was overlapped by the preceding somite. The lateral borders are destitute of any epimera, a fact, which taken in connection with the bases of paired and jointed appendages (to be presently noticed) on the underside, strongly suggests the ambulatory rather than natatory habits of the animal of which the fossil-remains under consideration formed a part. Assuming that we have nearly the whole of one segment seen in Fig. 1 A. the breadth of this segment is 4 inches, and the total length 3½ inches, of which about 2½ inches were exposed, the remaining 1 inch being inserted beneath the hinder border of the anterior segment.

An inspection of the ventral aspect of the same fossil reveals to us, a structure unlike that of any palæozoic Crustacean heretofore met with (See Sketch No. 9, Fig. 2 B.) but peculiarly insect-like. We see in the centre a narrow sternal piece *(s.)* deeply infolded down the median line, from which pairs of limbs take their rise *(n, n; o, o)*. Of these limbs, only the strongly-arched and flattened basal joints, with fragments of the 2nd articulation remaining at *n*, *n*, are preserved.

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* The original of which still remains in the Museum of the discoverer, James Powrie, Esq., F.G.S., of Reswallie, Forfar.

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In all the Merostomata both those belonging to the Eurypterida and to the Xiphosura *(i.e.*, the long and the short-bodied divisions, represented by *Pterygotus* and *Limulus)* the appendages are confined to the mouth ; or, where other organs exist, they are always modified to act either as respiratory or reproductory organs.

The appendages in Dr. Mc Cullough's specimen, however, cannot be referred to either of these functions, but are clearly the basal points of organs specially differentiated for locomotion, and, so far as we are able to judge by comparison, they are most probably the basal joints of true running or walking limbs, rather than of swimming feet, although some of them we may conclude (on the evidence of the fragments of limbs in Sketch No. 10, Figs. 2 and 3) were provided with chelate terminations.

The basal joint of these walking limbs is 3 inches in its greatest length ; it is only 2 lines in breadth at the proximal end but increases rapidly to 16 lines, its greatest breath, at the distal extremity. The legs must have been very robust as the section of one, exposed on the border of the fosil, shows it to have been 9 lines in thickness. The under surface of the limbs and sternum appear to have been smooth and destitute of ornamentation of any sort ; whilst the upper surface of each limb was evidently covered with prominent rounded tubercles irregularly dispersed over each joint. This is shown by the detached limbs seen in Sketches No. 10, by the displaced limb seen at *e, e*, sketch 9, Fig 1 A., and is proved by an examination of the before-mentioned section of basal joint preserved *in situ* (Sketch No. 9, Fig. 2 B. *x)* where the upper surface is seen to be distinctly tuberculated. From the preservation of a second pair of appendages *(o, o,)* belonging to another segment posterior to, but apparently like that of which both the upper and under surfaces are preserved, we perceive that the fossil forms part of a Crustacean having its body composed of a series of segments of nearly equal size, each segment being furnished with a pair of ambulatory or other appendages for the most part adapted for walking ; in other words resembling a modern Isopod.

Among the *Idoteidæ* the form presents itself which appears to us most suitable for illustration of this fossil remain, namely, the *Arcturus (Idotea) Baffini*, Westwood (figured in the annexed woodcuts.)

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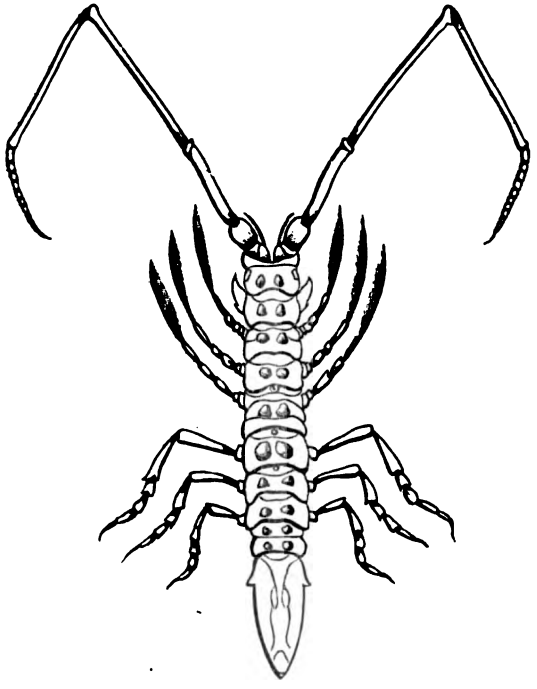
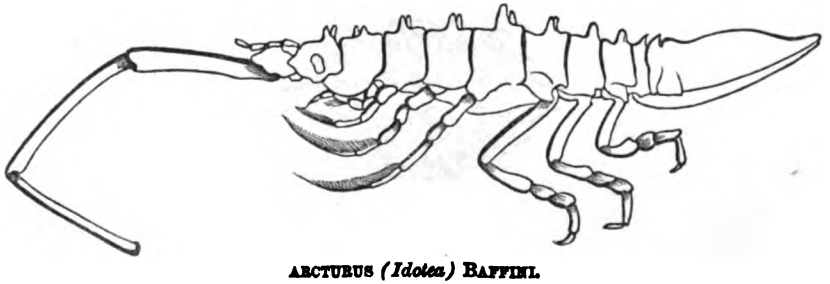


ARCTURUS *(Idotea)* BAFFINI,
(Dorsal Aspect.)



ARCTURUS *(Idotea)* BAFFINI.
(Lateral Aspect.)

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The Family *Idoteidæ* are thus characterised "Terminal appendages of the last false legs very large, lamellated, covering all the lower surface of the abdomen, and not projecting beyond the first segment which is shield-like and very large."

In *Arcturus* the body is long, the four first pairs of legs are lamellar at the end, and not fitted for walking or seizing; the three last pairs of legs are formed for walking. The Antennæ are very large, and are (like the legs of other genera) employed in seizing and enclosing their prey.

In *Arcturus Baffini* the segments are not very rugose, but each is marked by two very prominent spines situated in the same position as the depression in the fossil tergum (sketch No. 9, fig. 1A).

In *A. longicornis*, Sby., another and smaller species found on our own shores, the dorsal aspect of the body is rugose, in the same irregular manner as in the fossil.

Comparing the fossil with the recent Crustacean, it is probable the segments in Sketch No. 9 formed two of the three posterior appendages furnished with walking limbs.

It would be rash to speculate upon the actual relation of the other fragments (sketch No. 10), but they are clearly parts of both simple (fig. 1) and chelate (figs. 2 and 3) appendages. Perhaps fig. 1 (sketch 10) may have been one or more of the antennæ crushed, which were probably of large size in the fossil as well as in the recent form.

I propose to name this fossil *Præarcturus gigas*, although I hope, through the activity of the members of the Woolhope Club, to have ere long to re-describe it from more perfect remains.

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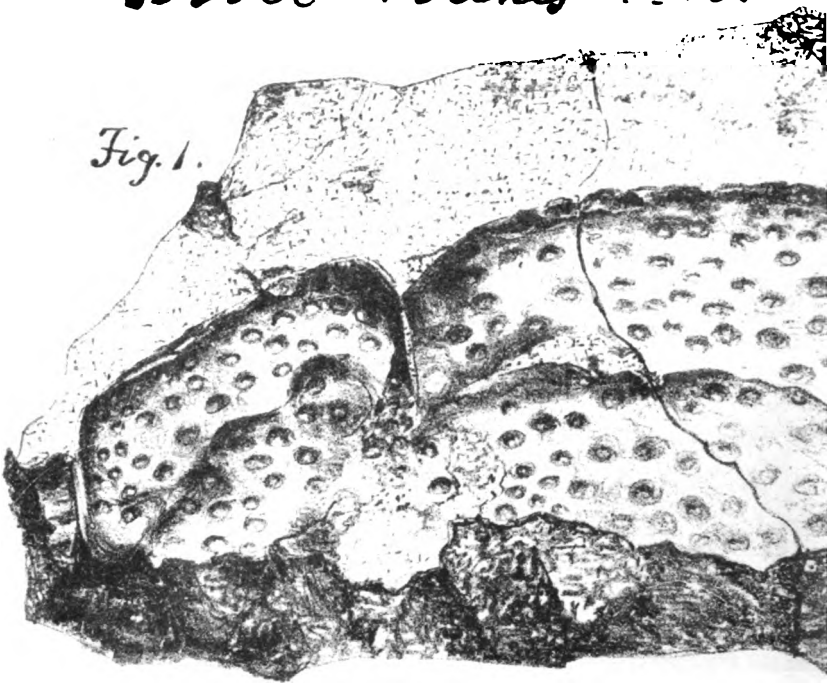
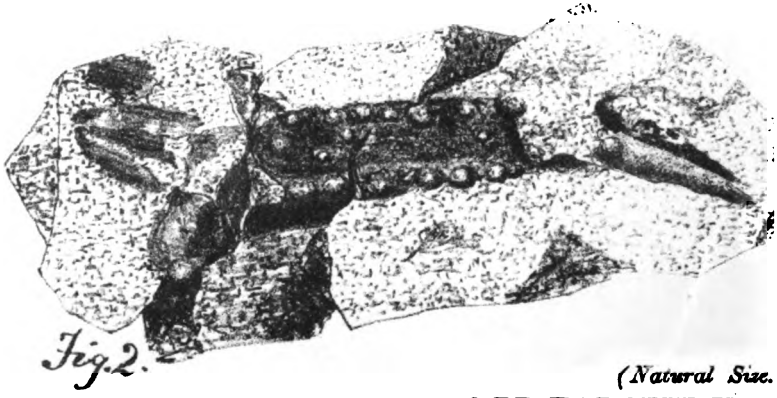
Fossil Sketches No 10.





(Natural Size.

Appendages of PRÆARCTURUS
Old Red Sandstone Beds. Row
D. M. McCullough, M

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Fig. 3.

ral Size.)

RUS GIGAS.—*H. Woodward.*

Rowlestone, Herefordshire.

gh, M.D. 1869.

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On *NECROGAMMARUS SALWEYI*, (H. Woodward) an amphipodous crustacean from the lower Ludlow of Leintwardine.

BY HENRY WOODWARD, F.G.S., F.Z.S., &c.

Whilst visiting Ludlow and its Museums last year, I had the opportunity to examine the very interesting Crustacean fragment preserved in the cabinet of Mr. Humphrey Salwey, of the Cliff, Ludlow, which was noticed and figured in Messrs. Huxley and Salter's important work on the *Eurypteridæ* (Memoirs of the Geological Survey, Monograph I., 1859, p. 25, pl. XIII., Fig. 7.) Prof. Huxley observes, "The fossil figured is evidently Crustacean, but it exhibits no character by which it can be identified as a part of a *Pterygotus*." (See Fossil Sketches, No. 11, Fig. 2.)

It differs from *Prœarcturus gigas*, inasmuch as it presents us with the side-view or profile, of what appear to be three laterally-compressed and thin-crusted somites or body-rings, whereas in *Prœarcturus* we see the full ventral and dorsal aspect of a thick, flattened, but slightly-arched segment without epimera. The feet also in *P. gigas* take their rise along the centre of the sternum, whereas in this Ludlow fossil they are articulated along the border. The section of the limbs is very different in the two forms.

The first somite (*a*) measures 10 lines in greatest breadth and 2¼ inches from the dorsal line to its sharply-pointed epimeral border, at the anterior side of which, at *x*, there appears to be the remains of the base of an appendage belonging to a preceding somite not preserved.

At the posterior side of the sharp epimeral border of this somite appears the base of a limb (*a* 1) nearly square in section which most probably belonged to the segment marked (*a*).

The second somite (*b*) is 11 lines in breadth and 1⅞ inches from the dorsal line to the broad truncated border from which the appendage (*b*, 2) takes its rise. A deep sulcus (*s*) passes over the dorsal line of this segment near the middle marked by a depression on the side where it dies away.

The third segment (*c*) is 10 lines broad and measures 2 inches from the dorsal line to the sharply-pointed epimeral border; from the posterior side of this the limb (*c* 3) is given off of which six joints are visible, the first or basal

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joint not being seen. Joint (2) is broadly rounded, joint (3) is narrower and more elongated; joint (4) is hollowed out to receive joint (5) which is larger but similar in form to (4) and also to joint (6) which is, however, the smallest of the three joints 4, 5, and 6 have each their distal borders sharply pointed. The 7th and terminal joint is a simple claw, not chelate. The total length of this entire appendage is 2 inches.

Having instituted a most careful comparison of the fossil with the somites and appendages of various recent forms, I am led to refer it to the order Amphipoda—Normalia and to the division *Gammaridæ* among some of the natatorial forms of which occur limbs not unlike the fossil before us. I therefore propose to name it *Necrogammarus** *Salweyi*, after its discoverer.*

Although it may seem rash to refer such very fragmentary remains as this and the preceding one to any special Crustacean family, yet I venture to believe that the very fact of my describing the one and recalling attention to the other may lead to the prosecution of fresh investigations, by the Members of the Club, of the beds in which they occur and thus to the discovery of further evidence which may more fully elucidate these remarkable forms.

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* From νεκρός dead, and proper name.

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Fossil Sketches No 11.

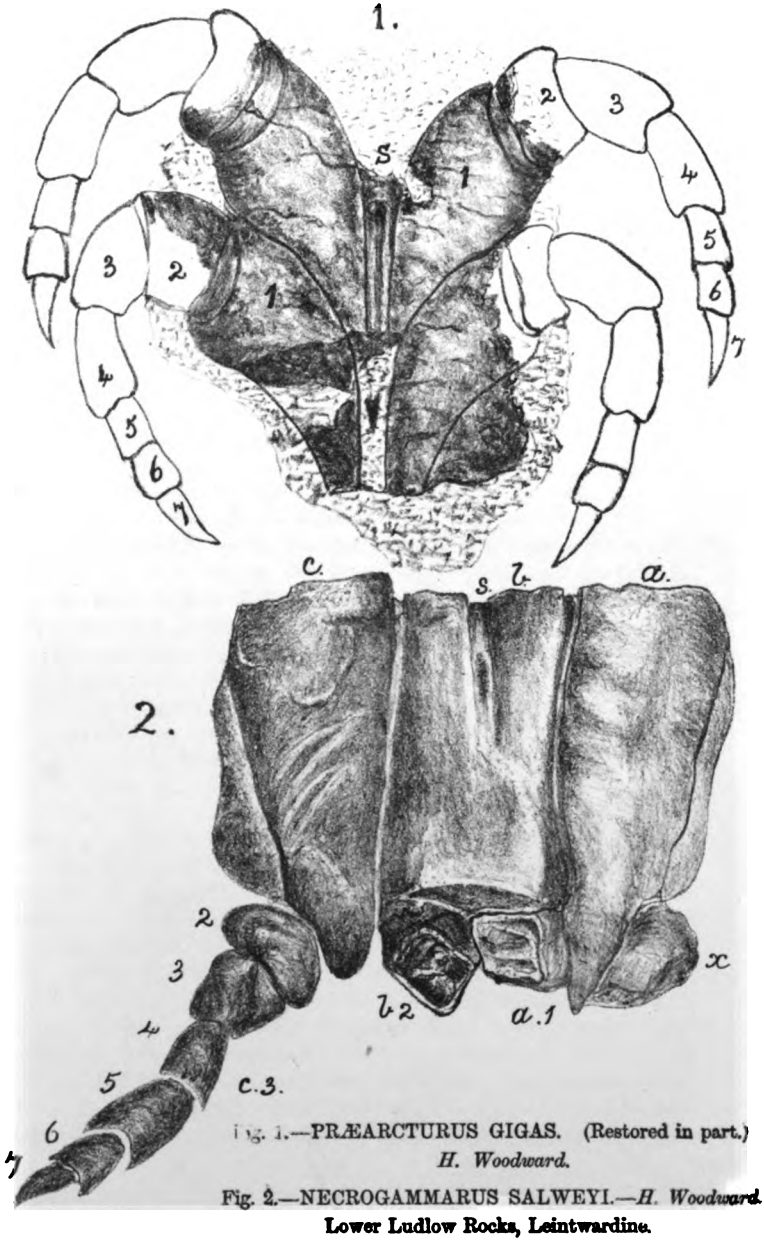

Fig. 1.—PRÆARCTURUS GIGAS. (Restored in part.) *H. Woodward.*

Fig. 2.—NECROGAMMARUS SALWEYI.—*H. Woodward.*

Lower Ludlow Rocks, Leintwardine.

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ON THE PASSAGE BEDS IN THE NEIGHBOURHOOD OF WOOLHOPE AND ON THE DISCOVERY OF A NEW SPECIES OF EURYPTERUS AND SOME NEW PLANTS IN THEM.

BY THE REV. P. B. BRODIE, M.A., VICAR OF ROWINGTON.

The "Passage beds" between the upper Silurian rocks and the old Red Sandstone on the outer area of the Woolhope valley, although they have been already noticed by Sir R. Murchison, Professor Phillips, Strickland, Symonds, and myself at Hagley, Perton, Tarrington, and Ledbury, have not in this district received the attention they deserve, for although they are of comparatively limited vertical thickness when compared with the finer and more complete sections at Downton and the Ledbury tunnel, they occupy a larger extent round the valley of Woolhope than has been previously recognised, and contain some new and interesting species of fossils.

At Putley, near the road from Ledbury to Woolhope to the N.E. of the latter village, a remarkable bed of very hard, horizontal Sandstone, composed mainly of small pieces of quartz in a sandy matrix, overlying a stratum of white and yellow clay used for making tiles, may be seen in a brickyard to the depth of about 3 or 4 feet, the blocks of sandstone averaging about 2 feet in thickness. I could find no fossils in it, and it had very much the aspect of a volcanic rock; but my friend, Professor Phillips, to whom I sent a specimen, recognised it at once, and states that he believes it to have been derived from trappean and other plutonic rocks, though it may be presumed to be one of the beds of sandstone belonging to this series. About two miles to the south of Putley, at a farm called Chandler's, there is a sandstone quarry, having a dip to the N.E., which yields large blocks 1 foot and ½ square, a portion of which is of a very dark colour, almost black, similar to the peculiar volcanic-looking rock just referred to, and at one place the strata are much contorted, being thrown up in a small anticlinal. From the top of Marcle-hill for at least three-quarters of a mile, in a lane leading to the quarry at Chandler's, on each side of it there is a thin band of Sandstone running parallel with the road but no "Olive Shales"

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appear above it. Three miles to the north, on Putley-common, near Maine's-wood, other beds of a close-grained more or less quartzose Sandstone occur, in which I found the cast of the larger form of *Lingula cornea*; this seems to correspond with the hard micaceous grit (though there of a purple colour) at the Tin Mills, Downton, which immediately overlies the "Olive Shales," and there contains the *Lingula cornea* in abundance. The beds were much disturbed, and more or less inclined, as most of the beds are here dipping from the older Silurian rocks of Woolhope, and in the same direction, for the most part, on this side. The partial opening was of no great depth, and therefore the thickness of the Sandstone visible was of limited extent, but, judging from the relative position of the sandstone formation on the west, and the Old Red Sandstone on the east, the thickness would perhaps be considerable if fairly exposed. A mile or two towards the north-west, near Lower Marcle, between this spot and Tarrington, is a small quarry of thick-bedded variable Sandstone, charged with the usual carbonaceous remains, but finer-grained than those already described. On the same line, still further towards the north-west, on the brow of the rising ground called "Hillfoot," similar bands of Sandstone are exposed, more or less disturbed, dipping towards the north-east, and underneath them the "Olive Shales," three or four feet thick, passing into and resting on a thin stratum of Sandstone similar to the section at Perton. The Shales are horizontal and contain in the lower part abundant fragmentary remains of plants, among which are the seed vessels of Lycopodium and larger fruits which seem to be quite distinct. I could find no crustacea, but a longer and careful search would no doubt detect them. I also obtained one specimen of the smaller form of "*Lingula cornea*," supposing this species to be identical, which Mr. Symonds thinks it is not. In no other places where the Sandstones are present have I observed these Shales except here and at Perton, but probably, though not exposed elsewhere, they extend for some distance in this district, and are to be looked for between the Old Red Sandstone and upper Ludlow rocks. Owing to the very few exposures of rock hereabouts it is very difficult to get anything like a clear and consecutive section. Here and at Putley brick-yard there is a want of conformity, the only two places I have observed this, for as a general rule the passage beds are conformable to the Upper Silurians. About two miles further on is the better-known quarry at Tarrington. Six to eight beds of Sandstone varying in thickness, colour, and lithological character are here seen divided by thin partings of yellow and grey coloured clay, having a total thickness of about twenty feet, with a rapid dip to the north. I could detect no Olive Shales here, and the only fossils are the usual carbonized fragments of plants, including the characteristic Lycopodites. Some of the blocks of Sandstone are of large size, and would no doubt form a useful building stone. The next exposure of the Sandstones, including the "Olive Shales," is at Perton, a mile and a half distant to the east, which I have already referred to in a short paper published in the Geological Journal (vol. xxv., part 1,

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March 1869), but as I was unable then to give a detailed section, it may be desirable to add it now in descending order :—

	Feet	In.
1 Divided beds of Sandstone in their bands	2	0
2 Dark brownish Shales	3	0
3 Yellow Sandstone	1	6
4 Olive Shales, brown and green, more or less indurated, but generally very brittle and sandy, slightly micaceous, and having an irregular fracture	5	0
5 Thin bedded Sandstone	0	5
6 Olive Shales, often arenaceous, with a thin sandy layer at the base, similar in structure to No. 4	5	0
Total	16	11

I was only able to make out this section satisfactorily by the aid of a ladder. The upper Sandstones thin out rapidly to the south-west, the olive Shales rising to the surface, but too high up to be reached.

The lowest stratum, No. 6, crops out at the north-west corner of the quarry, and on the authority of a man who had formerly worked in it there is a good, thick workable stratum of Yellow Sandstone underneath, though I could see no trace of it. If this should prove correct it is probably the Downton sandstone. All the Sandstones are more or less fossiliferous, and yield the usual remains of carbonised plants and abundance of Lycopodites. The crustacea appear to be confined to the "Olive Shales," Nos. 4 and 6. I sent up all I procured to Mr. Woodward and he informs me that the greater number belong to *Pterygotus Banksii*, with the exception of a small tail. One specimen of this genus consists of a considerable portion of the body; the others are chiefly fragments of the body, heads, tails, claws, and swimming feet. I was fortunate enough to discover an entire and new species of *Eurypterus* (see plate) which Mr. Woodward has named *Eurypterus Brodiei*, and described at the last meeting of the British Association at Liverpool. It is perfect from the head to the apex of the sharp pointed tail and measures 2¾ inches in length and 10 lines in the broadest part of the body, and has a part of one of the swimming feet attached. It is embedded in a yellow somewhat soft micaceous Sandstone connected with the "Olive Shales."

My friend Mr. Woodward, of the British Museum, has favoured me with the following description of this new species of Eurypterus.

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ON A NEW SPECIES OF EURYPTERUS,

EURYPTERUS BRODIEI (H. WOODWARD),

FROM PERTON, NEAR STOKE EDITH, HEREFORDSHIRE.

BY HENRY WOODWARD, F.G.S., F.Z.S., &c.

In March, 1869, the Rev. P. B. Brodie, F.G.S., communicated to the Geological Society a short account of the occurrence of remains of *Eurypterus* and *Pterygotus* at Perton. (See Quart. Journ. Geol. Soc. vol. xxv., part 1, p. 235).

Mr. Brodie stated that the specimens collected at that time and submitted to me, were not considered to be new; in fact, they consisted, for the most part, of fragments of *Pterygotus (P. Banksii)* and *Eurypterus* (E. pygmæus, E. acuminatus, E. abbreviatus*, etc., already noticed by Mr. Salter elsewhere.)

Since that communication was read, Mr. Brodie has again explored this locality and has forwarded to me several parts and an almost entire example of a *Eurypterus* which differs considerably from any species previously examined by me, and of which I beg to subjoin a short notice.

The most perfect specimen measures 2¾ inches in length and ten lines in its widest thoracic segment. All the somites are united, and one of the swimming-feet, although injured, is still in place. The head, which is semicircular in outline, measures 4 lines in length, by 9 lines in breadth. The eyes are sub-central and the ocelli nearly central, as in the other species of *Eurypterus*. The first six segments (thoracic) succeeding the head, measure together 9 lines in length; commencing at a breadth of 9 lines they increase, at the 3rd segment, to 10 lines, and diminish, at the 6th segment, to 7 lines in breadth. The segments increase in length and diminish in breadth very evenly from the 3rd segment backwards. The borders of all the anterior segments are curved and the posterior angles slightly produced and somewhat acutely pointed.

The six posterior (abdominal) segments diminish in breadth backwards from six lines to two lines, and increase in the same direction, in length, from 1½ lines to 2½ or nearly 3 lines; the body being terminated by a slender ensiform telson, or tail-spine 7 lines in length. No sculpture is apparent on the segments or head but the integument, composing the former, indicates its tenuity by abundance of plicæ and wrinkles. The thoracic plate is very characteristic. It is 9 lines broad and two and a half in depth; this median appendage is spindle-shaped in outline, and is 3½ lines in length and 1½ lines broad. The swimming-foot is 2½ lines in breadth and ⅔ths of an inch in length, exclusive of the basal joint.

*See Mem. Geol. Surv. Mon. I. 1859. Pl. xii. fig. 22-46. p. 51. Also Quart. Journ. Geol. Soc., 1859, vol. xv. pl. x. p. 229.

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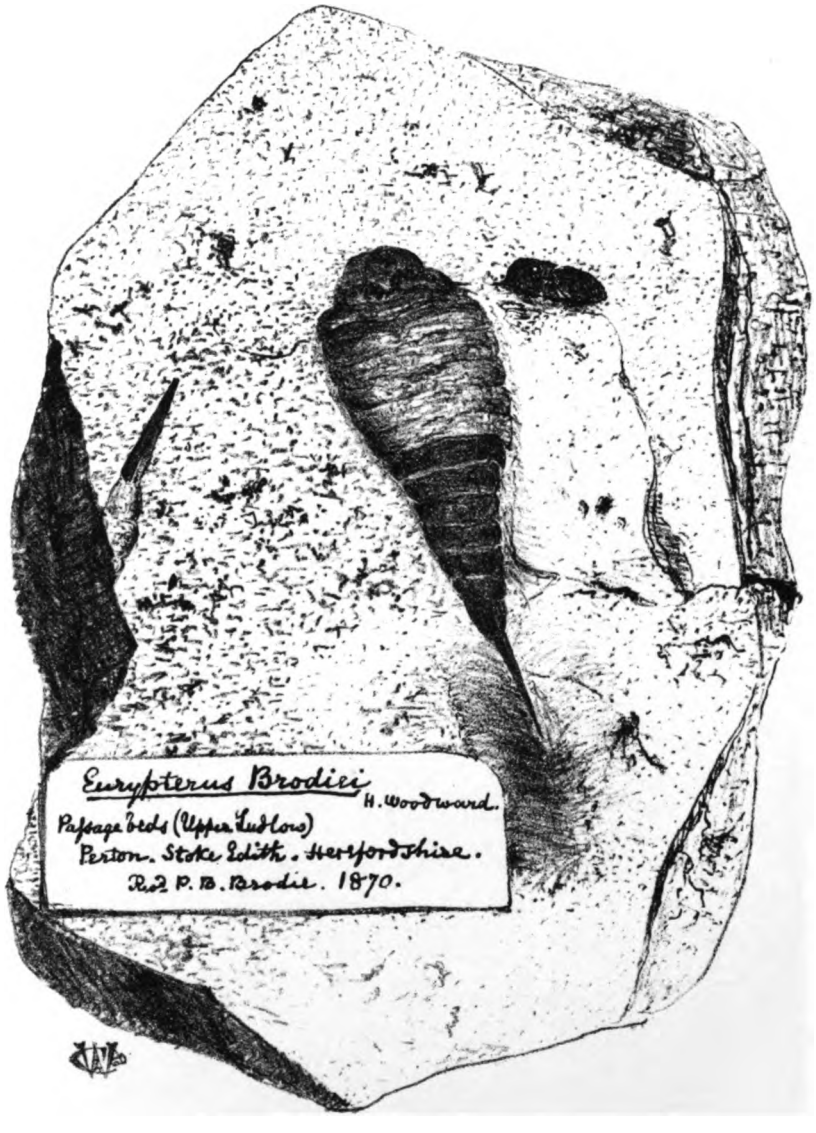
Fossil Sketches No. 7.



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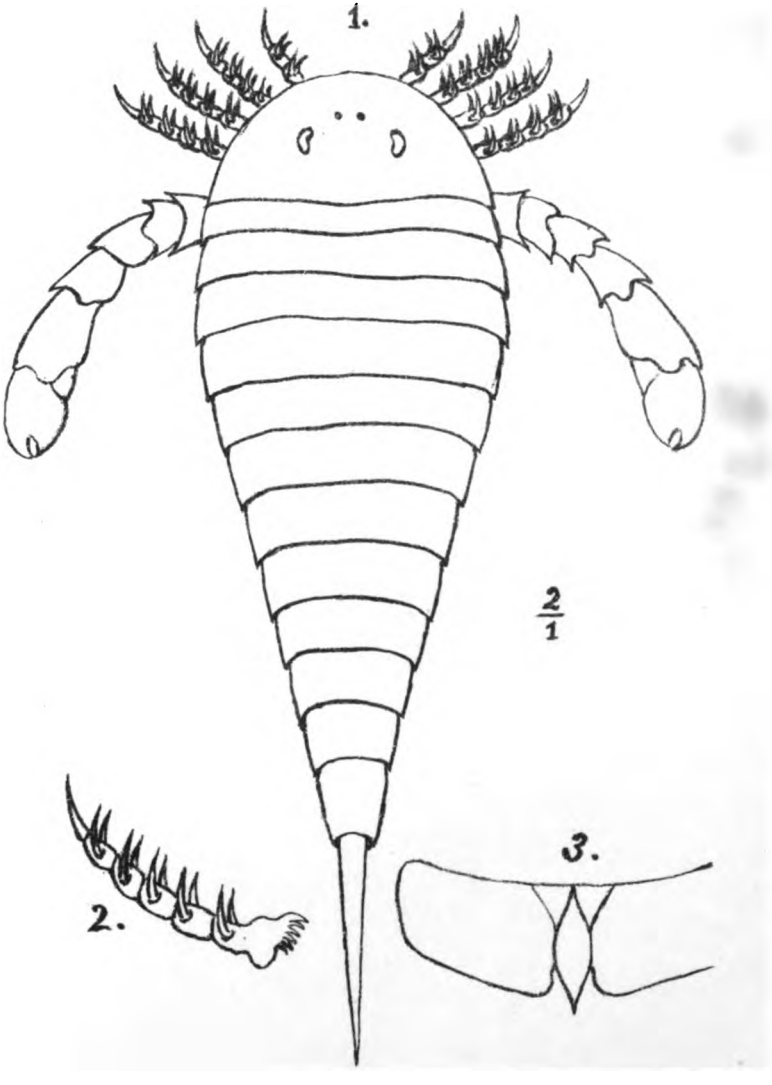

Eurypterus Brodiei. H. Woodward.
Fig. 1. Restoration 2/1 nat. size. dorsal aspect.
" 2. One of the ectognathary palpi.
" 3. Thoracic plate. very characteristic.

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It agrees closely in the form of its swimming feet with the American and Russian *Eurypteri*, having the same intecalated plate between the ultimate and penultimate joints, and also the minute terminal palette at the end of the 7th segment. Numerous detached endognathary palpi occur associated with this form, furnished with short recurved spines arranged in pairs upon each segment, doubtless referable to the same species.

I have proposed to name this form *Eurypterus Brodiei* after its discoverer. [See British Association Reports, Liverpool, 1870.]

These shales contain a species of Coral *(Actinophyllum ?)* not very common, but I could not observe any shells or *Berychia* which characterise them elsewhere, and only a few *Leperditia*.

In addition to the Lycopodites there are other plants which I sent to Mr. Carruthers, of the British Museum, for determination. He informs me, "though very interesting they are rather fragmentary, and, therefore, like most fossil plants, difficult to determine. The best marked is a dichotomously branching plant, which would be referred to an Alga by most botanists. I believe, however, it is a true land plant, which has had vascular tissue in its composition, and a sufficiently indurated structure to resist decomposition. It may belong to Dawson's genus *Psilophyton*; but more specimens are necessary before this could be determined. There are several bodies which look like seeds, but are more probably Sporangia. They are certainly land plants." It need scarcely be remarked that the occurrence of terrestrial plants, some of which may very possibly be new, in addition to those curious bodies long ago described by Dr. Hooker, and referred by him to Lycopodium, is a matter of much interest in strata of this age.

I have not been able to find any traces of the numerous fish discovered at Ledbury and Ludlow, but is is possible that a closer and longer search would detect them. At Prior's Court, about a mile south-west of this spot, there is a small exposure of Sandstones showing about two feet of divided beds of yellow Sandstone, with carbonaceous remains, resting on the Upper Ludlow, but no "Olive Shales." At none of these places could I detect the "Bone Bed" which has long since been noticed at Hagley, not far from this point on the north-east, first by the late Mr. Scobie, an active member of the Woolhope Field Club, and afterwards by my lamented friend the late Mr. Strickland, where, many years ago, in company with the latter and Sir R. Murchison, we found the "Bone Bed" and numerous remains of Pterygotus, but these were in the Ludlow rock and not in the passage beds which occur there, according to my friend Mr. Symonds, who states that they are present at this quarry. He says that the passage of the upper Ludlow rock with its "Bone Bed" may be observed here with the yellow Downton beds, succeeded by red marls precisely similar to those in the

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Ledbury tunnel. On my first visit to this quarry they were not exposed, and were not visible at a later one, and it has not been worked now for many years. I cannot, therefore, say decisively whether the Olive Shales are present there *in situ* or not. The "Bone Bed" here and at Gamage Ford probably belongs to the lower "Bone Bed" which in Shropshire is present in the higher portion of the upper Ludlow, not far below the thicker mass of the Downton Sandstone, while another and upper one occurs about the middle of the "Olive Shales," but is apparently wanting here. I searched in vain for the "Passage Beds," more to the south near Sollers Hope, where they might be expected to come in, unless a sandy marl, of which a section may be seen in places along the brook which traverses the lower ground, belongs to them. It contains a small *Orthis* and *Berychia*, but it most likely belongs to the Ludlow formation. They may or may not be continuous round the whole of the outer limit of the Silurians, but I think it probable that here and there they might be detected in road-side cuttings and throughout the whole of this area, and I hope at some future time to be able to investigate this point more closely. At any rate a more considerable extension has been shown, especially to the east of Woolhope, and the presence of the "Olive Shales" exactly identical, lithologically and to a certain extent zoologically, with the "Olive Shales" near Ludlow, and other places in that district, is distinctly proved.

On the west and north-west of Woolhope and south towards Fownhope there is less chance of observing these Passage rocks, if they occur there, because there is a very considerable quantity of Drift, which would overlie and conceal them. This larger mass of Drift, derived mainly from the denudation of the Silurians of the neighbourhood, was first noticed by my friend the Rev. F. Merewether, Vicar of Woolhope, who, in a short paper read to the Woolhope Field Club in Oct., 1870, has pointed out a thicker and wider extension of Drift in this direction, and which had not been noticed before. In many spots these "Olive Shales" are not exposed, though they may be present *in situ*, but from their soft and friable nature a considerable quantity has no doubt been denuded, unless protected by the overlying Sandstones as they pass downwards into a more sandy stone, it is probable that there is some Sandstone below, but to what extent or thickness it is impossible to tell, but it cannot be very thick. In the only two places I have observed them, as at Perton, they rest almost immediately on the Upper Ludlow rock, and at Hillfoot, though not directly overlying it, the Ludlow Shales crop out not far from them. The subordinate Sandstone would then seem to be of far less thickness than the more massive Sandstone at Downton, Shobdon, and elsewhere. The Olive Shales are no doubt the equivalents in time of the red and blue Marls and greenish Shales (No. 12) at the Ledbury tunnel, described by my friend, the Rev. W. Symonds (*Geological Society's Journal*, May, 1860), and who remarks that "nowhere else could be seen such a view of the Passage Beds between the Silurian and Old Red systems," but though at no great distance westward, they are appa-

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rently much less developed along the Woolhope border. I visited this fine section when the tunnel was being made with several members of the Warwickshire Naturalists Field Club, and I recollect being much struck with it at the time. Formerly these Passage Beds were classed by Sir R. Murchison with the Red Sandstone, but latterly he has denominated them Passage Rocks, which seems altogether more appropriate as showing their intermediate character between the Old Red and the Silurian; but some geologists, I believe, still desire to have them restored to their original position in the Old Red. This, however, is a question which I do not pretend to decide, but which future discoveries of other organic remains may definitely settle, if it has not already been satisfactorily determined, my object now being rather to indicate a greater extension of this series around the Woolhope elevation than had been previously recorded. There are many interesting and important questions connected with all "Passage Beds," of which several are known to occur between two great epochs of geological time. It is well known that such transition periods contain several new forms of life, while many of those which characterise the older formation below were still in existence, and some pass upwards into the newer formation above, and others are peculiar and distinctive. Take for example the Rhœtic series coming in between the Trias and the Lias, the basement beds between the Lias and Inferior Oolite, and the junction beds at the top of the Wealden, between it and the Lower Green Sand. Hence it may be that old defined lines of demarcation will now have to be either remodelled or removed, since certain transition periods may be shown to prove a continuity of the geological record. Thus all such "Passage Beds" may in fact be connecting links between one great geological period and another, rather than breaks in the continuity of succession.

Note.—It is a curious fact deserving of notice, and which has not yet been fully explained, that in several instances at these points of junction between two great formations there are those peculiar deposits called "Bone Beds," made up almost entirely of the comminuted remains of Saurian fish and Crustacea, the two latter only present in the older Palæozoic rocks, as at the upper part of the Ludlow series, at the base of the Inferior Oolite and Trias, and at the bottom of the Lower Green Sand. Saurian remains are at present only known to occur in the Rhœtic bone bed.

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AN AUTOBIOGRAPHICAL SKETCH OF HIS STUDIES IN MYCOLOGY, BY ELIAS FRIES.

TRANSLATED BY JAMES RENNY, ESQ.

In western Smoland, between the rivers Nissa and Lagan, there lies a tract, sterile and inhospitable, but varied with mountain, marsh and lake, and shaded by forests, both deciduous and evergreen. Here, for forty-seven years was my father—ever to me, the most indulgent of parents—pastor of the church of Femsjö, and here was I born and educated. This little nook of earth, in its seclusion, smiles to me with a grace more winning than all the world beside, and still keeps green from the dearest memories of my youth. As our neighbourhood afforded no other boy of my age and station, my father, who at an early age had been himself an ardent botanist, introduced me to the fields of Flora to find there companionship amongst her children. Hence, by the time I had completed my 12th year, I was acquainted with all the principal plants of the district, and even now, at the distance of more than fifty years, most gratefully do I recall how I was walking with my mother in search of strawberries through a wood partially burned, when it was my fortune to light upon a noble specimen of *Hydnum coralloides*. This discovery first incited me to make the tribe of Funguses my study; but, on turning over Liljeblad's Svensk Flora, my only scientific book, I was annoyed to find myself ignorant of the word "lamella" there so frequently recurring. So, shortly after, walking with my father, I said to him, "Dic, pater, quid est lamella?" ("tell me, father, what is a lamella!") for my father never suffered me to speak to him except in Latin, so that I picked up Latin even before my native Swedish. "A lamella," he replied, "is a thin plate." With this explanation, the phrase seemed to me to describe so happily the fructification of Agarics, that by the next day I knew all the genera contained in that excellent work. More tardy, however, was the progress of my acquaintance with species, and I am hardly able to realise that by far the greater number of these found no place in my Flora. It was the year 1808, when the country, distracted by alliances, intestine dissension, and foreign war, suffered all sorts of military contamination throughout its length and breadth. The school of Wexio, which I attended boy and lad, was closed, and I remained in consequence altogether in the country. Thus it happened that I commenced from that period to describe all the Funguses I could find, and to call them by names

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Valeas, Vir aestimatissime et me in animo memori serva.

E. Fries.

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invented for momentary use, so that before I had passed through the lower and upper schools I had learned to distinguish from 300 to 400 species. In 1811 I and my classfellows said farewell to Wexio, to enter the University of Lund. I, indeed, carried thither with me a firmly rooted love for Upsala, the most ancient seat of botanical lore in Sweden. Fór the masters of the school, one and all, had admonished us to avoid Upsala, because the philosophical schools of Schelling and the Romanticists ("Phosphorism" as the taint was called in Sweden) were dominant in that University. Transferred from the mountains of Smoland to the misty level of Scania my companions thought they were plunged in the Stygian marshes, but to me it seemed that I was reborn into the Elysian fields, so attractive were the novelties which the University library within, and the untrod plains without offered me.

Although a mycological library properly so called was all but entirely wanting, none but those who have struggled with similar difficulties can picture with what rapture, ransacking the library every hour it was open, I recognised in the Flora Danica, in the works of Jacquin, and in the coarse engravings of Buxbaum, many species still unnamed which were perfectly familiar to me.

Lund supplied two teachers to whom I am mainly indebted for the direction and encouragement my studies required, A. S. Rezius and C. A. Agardh, the setting and the rising suns of Botany, each of whom treated me from the first with peculiar kindness and attention. The latter gave me Persoon's "Synopsis of Fungi," and from the former I obtained Albertini's "Conspectus of the Fungi of the Niskian district." It was from this last book more than from any other that I gained scientific instruction in the truest sense. In the following year I collected Hyphomycetes and Epiphylli, classes hitherto neglected; and I quickly apprehended that they were for the most part merely elementary conditions (as we say now) of more perfect growths. I have ever thought that these insignificant and ignoble species were not worthy of detailed description by any other than those who care but to add new species to received lists. The very facility which I found in describing them away from their native localities changed to weariness the pleasure I should have experienced in overcoming real difficulties. It has been always my custom to define every plant in its natural conditions of season and habitat, and I have throughout refused to take note of merely traditional descriptions. The year 1813, ungenial as it was with storms of thunder and rain, afforded an unusually abundant harvest of Funguses. I was absorbed for a time in the closest study for my degree in Philosophy, but when Homer and the Funguses equally claimed my attention I allotted to each its due share of my time. In the following year my academical specimens, as they are called, being completed, I was chosen Botanical Lecturer, and I could then devote myself with a safe conscience entirely to the study of Funguses; though at the same time I in no way neglected any region of the floral kingdom. In order to consult more copious botanical works than Lund possessed, in the November of this and the ten following years I visited Haunia, and there I delivered to the

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publisher the M.S. of the first part of my "Mycological Observations," consisting principally of growths collected in 1813. It was at this period that I was received with especial kindness by one, of all men I have ever known, the most amiable and courteous, the ever to be remembered Swartz, the founder of mycological study in Sweden. By his advice I began in this year my "Monograph of the Pyrenomycetes of Sweden," which I presented in 1816 to the Royal Academy of Sciences of Holm. I passed the next year, 1815, in Smoland, describing principally the Hymenomycetes, and on the harvest then gathered was founded the second part of the "Mycological Observations." By the negligence, however, of the publisher both parts are so corrupted by typographical errors that the descriptions in this work require to be recast.

Long experience of its use had impressed on me the insufficiency of Persoon's divisional method. I commenced therefore in 1816 to construct an entirely new system, subjecting at the same time all species to a fresh and complete analysis. I do not cease to regret that the construction of the microscope was yet so little perfected that I was not able at that day to turn to any use the more minute characters. It will, however, be readily felt how much astuteness was necessary in observing, for instance, the spores of the Hymenomycetes, which had been neglected up to that time, when every single species had to be re-examined in its own proper place of growth. The system of Agarics perfected in that year has met with an approbation so unchallenged that no one since has been tempted to supplant it. In 1817, a year marvellously productive of Fungi, I collected in my daily excursions a rich harvest of Gasteromycetes, which I have described in a pamphlet entitled "Symbols of the Gasteromycetes," and I also wrote the outlines of the "System of Mycology." In the conception of this work I had formed the intention of comparing my entire collections once more with nature, and also of increasing their number as far as possible in the following year. But in 1818 the fungus crop was so trivial that I sought in vain for many sorts in their well-known old places of growth; wherefore, from caution rather than of right, I omitted a great number of species quite familiar to me, and united others with their nearest allies in cases where a real difference existed. In the autumn of 1819 I again secured a large booty from the Scanian woods, and was able to insert several species then gathered in the first volume of the "System." The book was sent to press in that year, and completed for publication the next, though the publisher directed 1821 to be inscribed on the title. This year, as usual, I passed a long time in the forests searching chiefly for Discomycetes. I also prepared for publication the "Scleromycetes Suecici," sometime before commenced, in order to lay the foundations of my "Mycological System," vol. 2, the first part of which appeared in 1822, and the second in 1823. The forest of the Femsjö district and the copses of the Scanian plain contain great variety of timber, pine, fir, beech, alder, birch, poplar, lime, and others. Each distinct group supplied me in turn with its peculiar treasures and afforded great facility to my labours. How earnestly

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did I desire that summer, that I could extend these labours to foreign lands, but my slender means denied the wish; nor in those times (O happy ye who are students in this later day!) could any hope be cherished of a public grant or salary, so that I was not able to prolong my journeys further than my pedestrian powers allowed. With perfect health, and a tall agile frame, it was not a matter of difficulty with me to walk fifty miles a day. But in the year 1824, when I was exploring Middle Sweden for the special sake of illustrating the lichen-records of Swartz, Wallroth, and Acharius, while coasting the strand of Roslay in open boats day after day, and in storms of thunder and rain, I was attacked with severe illness, and continued to be an invalid for a whole year. Losing all hope of convalescence, I completed my "Catalogue of Plants of the Femsjö District" (includging Fungi), in memory of my natal soil; and then, for the purpose of making public several fresh discoveries, together with the systematical views I had newly formed, I dictated to my friend N. C. Ahnfelds my "System of the Vegetable World." With the following autumn, however, and the re-appearance of the Funguses, my health became restored, and I was able to re-commence my former excursions; so that by the winter I had thoroughly investigated the Auriculini, a class too little noticed. At this period immense quantities of the Fungi were sent to me from all countries, and I was daily occupied for a while with their examination. Such as were new I have described in the "Elenchus." But when Meyer and Wallroth with great noise and objurgation laboured to subvert utterly the lichenological system of Acharius, whose doctrine I maintained in its fullness, I devoted an especial study in 1826-27 to Lichens, for which group of plants I had preserved all my youthful fondness, and I also prepared several editions of the "Hortus Siccus of Swedish Lichens" (the first edition of collection 1-3, including a new division of genera, appeared in 1817), with the intention of founding, when the series should be completed, a permanent record of my principal groups. In 1828 I visited Germany, and devoted much time to the Berlin Museum. On my return I put in order the first section of vol. 3 of the "System," and in the following year the "Select Fungi" from the Berlin Museum, and the collection of my old friend Kunze. These finished, I was busied in digesting the "Europæan Lichenology reformed." At the entreaty of my publisher, however, I was compelled in 1831 unwillingly to concentrate my attention on the last section of the "Mycological System," when Kunze, who had undertaken to complete this portion, declined the task. This is the reason why the amphibelic and truly versiform productions it treats of (many, such as the Uredines, with an individuality utterly ignoble, for whose delineation I would waste neither time nor paper) have been so summarily enumerated by me.

During the next few years, though engaged in other matters, I preserved the habit of gathering the more remarkable Hymenomycetes. I discovered many, but I preferred to withhold their description for the opportunity of a general publication, rather than scatter them abroad piecemeal; for I have often

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experienced how much such a treatment tends to increase, rather than diminish, the difficulties of a more thorough study. Hardly, therefore, had I brought the "System" to a conclusion than I set about for the third time a fresh examination of the fungal world from the very beginning. In doing this I treated my previous writings as merely external auxiliaries, and I subjected every department to a new analysis with increased and novel aids. In the summers of 1832-34 I wandered daily in the forests, observing the Hymenomycetes (especially, of these, the Cortinarii), and comparing again and again my published description with Nature's moulding. In the winter and spring I collected Pyrenomycetes, and examined them with the microscope, which had received great improvements, both of construction and power, since the publication of the earlier portions of the "Systema." In the winter of 1832-33 was published a very ample collection of Lichens, and in that of 1833-34 an equally large gathering of Pyrenomycetes. The sketch of a new disposition of classes separating Discomycetes from Hymenomycetes was elaborated in those years and appeared first in 1835 in the "Flora of Scania." Now that I had fixed my abode at Upsala, I felt at once that I had been translated as it were into a new fungal world. My excursions during the years 1835-37, which I pursued with unwearied diligence, enabled me to collect a great harvest of Cortinarii, Hydna, &c., many of which were then collected for the first time. In January 1837 my "Criterion of a Mycological System" was sent to press, though from the difficulty of sufficiently illustrating the work (each synonym for instance requiring to be many times extracted and tracked through numerous books) it received its final shape only in June, 1838. In truth I can scarcely believe that any similar botanical work has required or has actually embodied observations so assiduous, or from their very nature so protracted, as this of mine has done; nor that any can have involved study more intense or more comprehensive in its range of authorities, which extends back even to the dawn of the science. The extreme conciseness, the almost statuesque style I adopted, the task I imposed on myself of omitting everything of which I might fail to convey a perfectly clear notion, increased, rather than diminished the broad proportions of my edifice. I had also formed the design of giving a new Synopsis of the Ascomycetes, worked out from six hundred new discriminations. My contemporaries, however, led by Corda, with a manifestly insufficient knowledge of the more perfect Fungi, formed an estimate of my exertions altogether inadequate. I allow that my present labours, more trained and better skilled, will now produce a richer fruit, and I rejoice to do so; but this cold reception made me reluctant to waste time, strength, and money on work so thankless and ill-appreciated, so that the design which I should have had high gratification in completing, rests only in outline.

In the year 1844 the Royal Society of Science of Holm decided to paint at their own expense all the species of the Hymenomycetes which could not be preserved in a dry state, and called on me to assume the task of directing the artists.

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Thus for the fourth time I approached the study of these Funguses anew. In the last twelve years nearly as many centuries of species have been depicted. When they shall have been given to the world I trust that the determination of their several boundaries will rest on a permanent foundation. As however the cost of this undertaking is not a little appalling, I have judged it useful to edit a Commentary on these delineations, in order to collect within one binding the descriptions of such species as I have selected to be copied, which are now dispersed through various books. Since, however, such a work may find but few readers, only 100 copies have been published.

Now in the evening of my life I rejoice to call to mind the abundant pleasures which my study of the more perfect Fungi, sustained for half a century and some additional years, has throughout this long time afforded me. Although I have not neglected to work out in detail every department of Botany, the Funguses have been my especial delight. The vast multitude of species deters many from this study, but the list of Hymenomycetes is not infinite, (as the Epiphylli may appear to be, though these present other reasons for examination) and I am pleased to think how rarely, for several years past, the discovery of any new variety has come to my notice. Therefore, to botanists, who can wander at will the country side, I commend the study of these plants, as a perennial fountain of delight and of admiration for that Supreme Wisdom which dominates universal nature.

[*Nota.* Since 1844, I have published only commentaries, in which are described Preiss' Fungi in Lehman's Plantæ Preissianæ, Walberg's from Natal in the Transactions of Rl. Sy. Holm ; Afzelius' from Guinea ; Liebman's from Mexico and the United States, Oersted's from the West Indies and Costo Rica, Didrichs' and Kamphöve's from the Nicobars and the Pacific, in Trans. Rl. Sy. Upsala, and various new Hymenomycetes of Swedish growth in the Trans. R. S. of Stockholm. I would desire also to commend to the attention of mycologists several papers in Swedish on the uses and biology of Fungi, which I have published, especially the "Calendarium Fungorum."]

OBSERVATIONS.

This "Historiola Studii mei Mycologici" is appended to the Monographia Hymenomycetum Sueciæ of Elias Fries, K—C. The interesting but too succinct account it gives of Fries' mycological studies evades, as external perhaps to the limits he had prescribed for himself, nearly all notice of the work he has done in Phanerogamic Botany. His results in this domain also are not a little important ; but here he was no longer turning up an all but virgin soil, and the visible splendours of his harvest are not so immediately discernible. It could not be however that the critical test, the most subtle acumen, and the diligence scorning fatigue, which have so largely recruited and marshalled into orderly array the undisciplined mycetal cohorts, should have produced no precious fruits when applied to plant tribes already enumerated and grouped. His researches, therefore, and the books which embody them in descriptions uniquely discriminative and clear, are of high value to the student who desires to take a broader grasp than usual of the British series of flowering plants (conterminous to the extent of more than three quarters with the Scandinavian series), and are indispensable to the botanist who would trace the Floras of our Islands in their corresponding species and representative congeners through the isothermal latitudes of Northern Europe. It is, however, on the volumes of his strictly Mycological Works, in which he has so marvellously condensed the observations and reasonings of many busy years, that he would rest his perpetual fame. Again and again

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does he refer to the toil they have cost him, and the satisfaction he has had in it. The "Systema Mycologicum," the symmetry of its lines improved, and its tracery sharper cut and more gracefully disposed by the "Epicrisis" and "Monographia," is veritably a monumentum ære perennius. He designs in this latter work, in the drawings he has prepared, and in the magnificent plates now in course of publication, to which it furnishes the descriptions, to remove the causes of all future difficulty in the discrimination of species defined by himself. It is in speaking of this plan that, with a strong and just conviction, and at the same time the modesty befitting so noble a character, he adapts to his position Virgil's line, "To the study of the Hymeno-and Gastro-mycetes, as the tribes at once the most noble and best capable of accurate determination, to Funguses in the strict sense, I have devoted the fullness of my powers, and I doubt not that posterity will recognise

'Quanti molis erat Fungorum condere gentem.'"

Most of the works mentioned in this paper, it may be said all but the most recent, have long been out of print. In the earlier years of the century the students of any branch of cryptogamic botany were few, fewer still those who took interest in the Fungi and Lichens. Fries' editions were not at any time large; even so late as 1857 he thought 100 copies of so important a work as that from which this translation has been made as many as could be disposed of within a reasonable period. Even now the cultivators of Fungology as a science are rare in any country, but they increase, especially here. It may be doubted if any of these fundaments of the systematic branch will ever be reproduced. It will probably, therefore, not be without interest to the Club to find letters appended to the titles of the several works here enumerated, which indicate where they may be found in several of our public or semi-public libraries, B.M. standing for British Museum, either in the general or botanical departments; K. for the library attached to the Herbarium at Kew; L.S. for the library of the Linnæan Society; and C. and E. for the University libraries at Cambridge and Edinbro'. There exist in one or more of these libraries other mycological works of Fries not mentioned by him in his "Historiola," some of which have more than an historical interest. The titles of them are here appended. Nearly all his contributions to the scientific societies of Sweden, &c., are to be found in the British Museum. The full list of them may be consulted in the Royal Society's Universal Catalogue of Scientific Papers (sub. Fries, E.), now in course of publication:—

Specimen systematis Mycologici, Lund. 1817, C;
Om Brand och Rost på, Wäxter (On Brand and Rust in Plants), Lund. 1821, C;
Boleti fungorum generis illustratio, Upsala, 1835;
Synopsis Agaricorum Europæorum, Lund. 1830;
Genera Hymenomycetum nova Expositio, Upsala, 1836;
Synopsis generis Lentinorum, Upsala, 1836, BM—K;
Anteckningar öfver de in Sverige vaxande ätliga Svampar (Description of Edible Fungi growing in Sweden), Upsala, 1836, BM—C;
Spicilegium plantarum neglectarum, Decas I. Agaricos:
Hyperrhodios sistens, Upsala, 1837, C:
Summa Vegetabilium Scandinaviæ, 1846, BM—K—LS—E—C:
Novæ Symbolæ Mycologicæ et Mantissa I., Stockholm, 1851:
Nya Svamparter (new Fungi), several papers in Tr. R. S., Stockholm, BM:
Sveriges ätliga och giftiga Svampar (Edible and Poisonous Funguses of Sweden, illustrated with 100 large colour-printed folio plates), Stockholm, 1851, BM—LS:
Icones selectæ Hymenomycetum nondum delineatorum Fasc. I. II. III., 1868—70, folio colour-printed plates, in course of publication, for which the Monographia Hymenomycetum Sueciæ supplies the descriptive characters, BM—LS—E.

The memoir "Svampernes Calendarium under mydlersta Sveriges horizont" (Calendar of Fungi adapted to middle Sweden), B.M., and its translations BM—K—LS—E—C, was first read to the Academy of Sciences, at Stockholm in 1857, was composed more with the design of being analogous than supplemental to the Calendarium Floræ of Linneus, which took no note of the seasonal appearances of the Fungi. A very cursory glance will convey the impression, independently of his recommendation, that it must be a favorite with him. It exhibits much of that partly poetic, partly metaphysical, manner of approaching a systematic and practical subject, which seems to colour the Scandinavian as well as the North Teutonic intellect, when much withdrawn from the current rough business of life. A similar halo envelopes several of his shorter essays; for instance, most of the casual papers he has collected and re-published under the title of Botaniske Utflygter—Fugitive Botanical Disquisitions—(nearly all are to be found in German translations, as well as in the Swedish in B.M.) It is to be recognised in the Systema Orbis Vegetabilis, and presents to us a pleasant phase of his mind, altogether different from that thoroughly practical habit which has developed the rigid and almost stern style he frequently adopts when confining himself to science purely. I call attention to this work because the information it affords is likely to be appreciated by the general memberhood of a Field Naturalists' Club. It has been translated by Nylander for the Annales des Sciences Naturels, 4th Ser., Vol. xii. for 1859, and it appears also in a German version in Flora of the same year.

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A SUPPLEMENTAL LIST OF THE ADDITIONS TO THE BRITISH AGARICINI DISCOVERED DURING THE PAST YEAR.

BY WORTHINGTON G. SMITH, ESQ., F.L.S.

A. (Lep.) metulæopora, *B. & Br.*
A. (Lep.) Terreii, *B. & Br.*
A. (Lep.) ermineus, *Fr.*
A. (Lep.) sistratus, *Fr.*
A. (Lep.) delicatus, *Fr.*
A. (Ar.) denigritus, *Fr.*
A. (Tr.) pravus, *Lasch.*
A. (Tr.) cælatus, *Fr.*
A. (Tr.) sordidus, *Fr.*
A. (Tr.) lixivius, *Fr.*
A. (Tr.) putidus, *Fr.*
A. (Cl.) clavipes, *Fr.*
A. (Cl.) nigrescens, *Lasch.*
A. (Cl.) tornatus, *Fr.*
A. (Cl.) orbatus, *Fr.*
A. (Cl.) parilis, *Fr.*
A. (Pl.) mutilus, *Fr.*
A. (Col.) distortus, *Fr.*
A. (Col.) coracinus, *Fr.*
A. (Col.) murinus, *Batsch.*
A. (Col.) clusilis, *Fr.*
A. (My.) cohærens, *A. & S.*
A. (My.) atro-cyaneus, *Batsch.*
A. (My.) ammoniacus, *Fr.*
A. (Omp.) leucophyllus, *Fr.*
A. (Omp.) rusticus, *Pers.*
A. (Lep.) lappula, *Fr.*
A. (Lep.) solstitialis, *Fr.*
A. (Lep.) lasulinus, *Fr.*
A. (Nol.) verecundus, *Fr.*
A. (Ph.) confragosus, *Fr.*
A. (Heb.) phæocephalus, *Bull.*
A. (Heb.) calaminstratus, *Fr.*
A. (Heb.) geophyllus, var. lateritius, *Sow.*
A. (Heb.) scabellus, *Fr.*
A. (Heb.) firmus, *Pers.*
A. (Heb.) elatus, *Batsch.*
A. (Fl.) mixtus, *Fr.*
A. (Fl.) alnicola, *Fr.*
A. (Fl.) conissans, *Fr.*
A. (Fl.) lubricus, *Fr.*
A. (Nau.) semiflexus, *B. & Br.*
A. (Nau.) scolecinus, *Fr.*
A. (Nau.) tenax, *Fr.*
A. (Nau.) crobulus, *Fr.*
A. (Ga.) rubiginosus, *Fr.*
A. (Str.) merdarius, *Fr.*
A. (Str) inunctus, *Fr.*
A. (Hyp.) lencotephrus, *B. & Br.*
A. (Psi.) agnarius, *Fr.*
A. (Pan.) acuminatus, *Fr.*
A. (Psa.) subatratus, *Batsch.*
A. (Psa.) caudatus, *Fr.*
A. (Psa.) empyreumaticus, *B. & Br.*

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INCIDENTAL NOTES ON REMARKABLE TREES IN HEREFORDSHIRE.

BY A COMMISSIONER FROM THE WOOLHOPE CLUB.

(N.B.—The circumference of the trees is always measured at 5ft. from the ground when not otherwise stated, and it will also save repetition to remember that the figures given always refer to feet and inches.)

"Hail! old patrician trees, so great and good,
Hail! ye plebian underwood,
Where the poetic birds rejoice,
And for their quiet nests and plenteous food,
Pay with their grateful voice.

Here Nature does a house for me erect;
Nature, the wisest architect,
Who those fond artists does despise,
That can the fair and living trees neglect,
Yet the dead timber prize."—*Cowley.*

Hail! all hail, too! to those scattered trees that have struggled through difficulties and conquered neglect to take unlooked for forms of beauty. Such trees in this luxuriant county are too frequent to be remarkable, and necessarily do not attain any great size, yet the eye ever lingers on them with pleasure, and they live in the memory as the redeeming points of a landscape that might otherwise be common place. Such trees do not come within the scope of these "Incidental Notes," which string together the description and exact measurement of some of the many trees to be found in Herefordshire which have not yet been noticed in the Transactions of the Woolhope Club, and which from one cause or another are remarkable.

The Oak tree is the great characteristic of Herefordshire. Pollard Oaks of considerable size are very numerous throughout the county. In many a meadow they form excellent rubbing posts for the cattle, and their remaining boughs shelter them from the sun's heat. In many a home orchard or rick-yard they serve as props for the hop poles, and in their hollow centres the turkeys make their nest. The great secret perhaps of their being so many, is that the storms which destroyed their tops rendered them useless for timber; and so it could be said of them

"Thou temptest none but rather much forbidd'st
The fellers toil which thou couldst ill requite."

and thus they have been allowed to grow to their full size and take in their

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THE REMARKABLE TREES
OF
HEREFORDSHIRE.

THE MISTLETOE-OAK OF BREDWARDINE.

(Quercus pedunculata—Viscum album fœm.)

MARCH, 1871.

This interesting tree grows in a hedge-row of a field called the "Lower House Field," at Bredwardine, about half a mile west from Moccas Park. It was discovered a few weeks since by the Rev. Sir Geo. H. Cornewall, Bart., when engaged with his Steward in marking trees for felling. It is a thoroughly mistletoe-possessed tree, for the parasite grows in 15 different places upon it. The circumference of the bole at five feet, where the card of the Club is placed, is 11ft. 6in.; the height of the tree 78ft.; and the diameter of its foliage spread 80ft.

This tree makes the tenth known example of a mistletoe-bearing oak, and it is a far larger and finer tree than either of the three others in the County. The small leaning tree by its side is about to be felled.

This Photograph is kindly presented to the Club by the Rev. Sir Geo. H. Cornewall, Bart.

(Ladmore and Son, Photographers to the Woolhope Naturalists' Field Club.)

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decay the varied forms of picturesque beauty they now present. There are many also of these old Pollard Oaks which from the position they occupy have been allowed to pass through all the stages of their existence without other ills to contend with than such as tree life is necessarily subject to.

The vallies of the Wye and the Lug and their tributaries abound with these ancient relics of tree grandeur which are usually held in much esteem by their owners, and by the inhabitants of the district. Their great age insures this tribute of respect. The Iolo M.S. as versified by Miss Jane Williams says :

> Three hundred years an Oak expends in growth,
> Three hundred years in majesty stands forth,
> Three hundred years declines and wastes away,
> Then dies, and takes three hundred to decay.

The many generations of men these trees have seen out : the many changes which have taken place during the long period of their existence : the many varied scenes enacted as it were in their presence, are all in some sense expressed in their very aspect, and certainly throw an air of romantic history around them. In a life-time these old trunks scarcely seem to change, and yet ever and anon when its decay has reached a certain point a storm blows an old tree over, and as other generations of men witness its gradual decay, the beauty of old Chaucer's moralising lines forces itself upon the mind :

> "Lo the oake that hath so long a norishing,
> Fro' the time that it ginneth first to spring,
> And hath so long a life as we may see,
> Yet, at the last, wasted is the tree."

These old trees are too numerous to mention individually, and only such of them will be described in these notes as seem from their position or other circumstances to be worthy of record.

"Eve" at Moreton Station *(Q. pedunculata)*.—Some thirty or forty years ago there stood in the Lug meadows, near Moreton, two very large Oak trees, about a hundred yards apart. They were great massive trees, and were known by the names of "Adam" and "Eve." Though still lofty, they had suffered from many a storm, had lost many branches, and were perfectly hollow. During a violent storm about this time—possibly that of January 7th, 1839—"Adam" was completely blown down, and lay for some years afterwards in the meadow. "Eve," too, lost its top and remaining branches at the same time. The spacious cavity within this latter tree has long been well known; 21 grown sheep have been counted as they came out from it ; a party of 13 are said to have drank tea within it ; and it has been the scene of much pic-nic-ian fun. When the Shrewsbury and Hereford Railway was made, the line included Eve in its boundaries, and the hollow bole was quickly appropriated as a residence by an economical navvy. The top was sloped off evenly from 9 feet on one side to 16 feet on the other ; a thatched roof was put on ; a brick fire-place was built in a low opening on the south side, with a chimney beside it ; a door was fitted to the

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principal opening on the east side; and thus it was converted into "a family tenement, compact and convenient." For many months after the line was opened for public traffic this hollow bole actually formed the only residence and office for the station master, all complete in itself. It then became the lamp room, and was used for this purpose for some fourteen years, until 1869, since which time it has been converted into a stable for a donkey. The bole was alive so late as 1868, when it still put forth a few green twigs on the south side. It is now quite dead, but in its dried state it still measures 25ft. 8in. in circumference.

In an adjoining field on the other side of the Lug, belonging to Mr. Hodges, of Marden Court, is a picturesque pollard Oak *(Q. pedunculata)*. The lower part of the bole bulges out in large excrescences, measuring in circumference at a foot from the ground no less than 38ft.; at 5ft., the natural girth of the tree, it is 20ft. 4in. The tree sends out fine massive branches, which are very luxuriant.

THE ST. DEVEREUX PARK OAK.—At the back of Stoke Edith, on the south side of Seagur Hill, lies St. Devereux Park, whose history bids fair to be lost since nobody will write it. It is very parklike and pretty, and many good Oak trees are scattered about it. At least such was the case in 1864, when these "Notes" were taken of it. By the road leading from Putley to Woolhope, which bounds its eastern end, was a group of very noble trees, nearly 90 feet in height, which gave the measurements of 16ft. 4in.; 14ft. 6in. 14ft.; 2in., and 11ft. 9in.; and other trees measured about the Park gave these figures—14ft. 5in.; 14ft. 10in.; 14ft. 7in.; and 17ft. 3in. The extraordinary Park-Oak-in-chief, which it is the object of this paragraph to describe, is situated at the eastern corner of the large pool. It carries up its bole some 30 feet to nearly half the height of the tree, and at 5 feet from the ground it has a circumference of 19ft. 5in. This is a very fine growing tree without any sign of decay. It is the best on the Stoke Edith domain; and for bulk and vigour combined with size, one of the finest in the county.

THE ROSEMAUND OAK *(Q. pedunculata)*.—The remains of this grand old tree are still growing in the Oak meadow at Rosemaund, in the parish of Felton, on the estate of Henry Pitt, Esq. It stands on high rising ground near the house, and although it is perfectly hollow and has lost all its large limbs, it has yet considerable vitality and has an abundance of foliage. At about 20 feet from the ground it is divided into two main branches which extend but a few feet, where they are dead and broken off. One side of the trunk is fitted with a doorway, and seats are placed round the inside. It is open to the top, and thus it is converted into a summer-house at once roomy and airy. The inside has a diameter of about 6 feet, and will accommodate nearly 18 feet of

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board sitting space. Its circumference at 5ft. from the ground, avoiding excrescence as far as possible, is no less than 34 feet, and this is not an unfair measurement. It is the remains of a very magnificent tree. Who shall say its age, or the scenes it has witnessed? Perchance it might itself say—

> "In my great grandsires trunk did Druids dwell,
> My grandsire with the Roman Eagle fall,
> Myself a stripling when my father bore
> Victorious Edward to the Gallic shore."

Decay is making sad havoc with it. Spaces have to be filled up here and there with boards to make the summer-house habitable. The bark is gone in some parts; in many places at the ground level it is rotting away; and beneath its roots a colony of rabbits have long found a home. The end of its long life is approaching; albeit, it may last out yet a few more generations of men and of rabbits.

In the same parish, at the Green Farm, near the pool by the road side, just below the vicarage, is another Pollard oak, measuring 21ft. 1in. in circumference. It is a mere "runnel" of a tree, as the rustics say, that is with a hollow bole, but still of a good size, covering itself with foliage, and very picturesque.

THE HEMLOCK SPRUCE FIRS OF BELMONT.—This very beautiful group of three trees grows at the foot of the steep bank on the north side of the lawn at Belmont, and can therefore be seen to great advantage by looking down upon it. The largest tree has a clear bole of 17 feet, and the whole height of the tree is 45 feet. It has a circumference of 6ft. 11in., and contains 95 feet of timber. The branches sweep to the ground on every side, and the foliage spread has a diameter E. and W. of 51 feet, and N. and S. of 24 feet. The general outline of this tree is most graceful, and has been made more so by the upper sixth bending away to the north to avoid the shade of a neighbouring Oak. The two fellow trees are also very beautiful, and are each of them 5ft. 11in. in circumference.

THE BURGHILL EVERGREEN OAKS.—The finest Evergreen Oaks (*Quercus ilex*), in the county, and amongst the very finest in England, are those in the home orchard of the Lodge, at Burghill. There are seven of these in a row, by the side of the high road leading to Canon Pyon, and thus they take, naturally, the names of the days in the week. They are in fine luxuriance, though past their prime, and it is well that a note should now be taken of them. The one nearest Hereford, "Sunday," is a very fine spreading tree. It has a circumference of 9ft. 10in., a hight of about 50ft., and a diametric foliage spread of 63ft. in diameter. It is decayed at the principal fork and will split ere long. "Monday" measures 9ft. 6in. in girth, and has lost some branches. "Tuesday," 8ft. 8in.

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decayed in centre, and has lost several side boughs. "Wednesday," 7ft. 7in., has lost its top. "Thursday" has the circumference of 7ft. 11in., but bulges out at the base to 18ft. 5in. "Friday" measures 6ft 11in.; and "Saturday" only 6ft. 2in., a small, low tree, but with a large boss at its base, measuring no less than 18ft. 2in. in circumference at a foot from the ground.

The Evergreen Oak in the Rectory garden, at Ross, is a very fine tree. At a foot from the ground, where it divides into two branches, it girths 10ft. 2in., and it rises to a height of about 60 feet.

THE CRUMP OAK.—There is a farm of this name about four miles from Kington, on the turnpike road to Hereford and it is fair to presume, therefore, that there was formerly some extraordinary Oak there which gave the name. No trace remains of such a tree now, but "the Crump Oak" of our time is a solitary tree situated about a quarter of a mile nearer to Kington in an arable field close to the turnpike road. It is a fine growing oak of the variety *Quercus intermedia*, with a straight solid trunk rising some 20 feet before it separates into its branches. It has a circumference of 14ft. 4in., and a diametric foliage spread of 27 yards N. and S. and 29 yards E. and W. It was estimated to contain 10 tons of timber some years since, and £80 was then said to have been refused for it. It grows upon the estate of Major R. S. Cox, of Broxwood.

BROXWOOD COURT

must be mentioned in passing, though the house is, as yet, but partly built, and the grounds but recently laid out and planted (in the year 1859). The broad avenue of Deodar Cedars stretching to the west will hereafter be the grand feature of the grounds. Now they are 19 years old, supposing them to have been 11 years old when planted, and they vary from 15ft. to 18ft. in height. They are, for the most part, very graceful trees and feather so closely to the ground as to defy all reasonable efforts to take their girth. There are also many fine specimens of Coniferæ of the same age growing well and freely. The north entrance is guarded on each side by a *Sequoia Wellingtonia*, planted in 1861. It may be interesting hereafter to know that at one foot from the ground the tree on the right side has a girth of 3ft. 9in., and that of the left of 3ft. 2in., whilst their heights are about 19ft. and 18ft. respectively.

MOOR COURT.

A broad avenue of Elm trees, somewhat more than half a mile in length, forms the handsome approach to Moor Court from the Leominster and Kington road. The house, as its name implies, is built completely in the valley, and is

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not seen until you reach it. The road through this noble avenue makes a considerable descent to it; it passes between the fishponds, and you have scarcely emerged from the shade of the Alder trees when you are there. The avenue is spacious in breadth, as it should be, that the tall forms of the Elms may be seen to advantage, and that the small foliage of the tree may receive those grand masses of light for which it is so well adapted. It is, perhaps, the finest avenue in the county, as certainly it is the most striking feature of the Estate. It has been planted at different times, but the trees have all attained their characteristic features. Below the second gate the Elms on each side are here and there alternated with Lime trees, and towards the end approaching the fishponds and the house, Scotch Firs in support of the Elms form, as it were, a double avenue. The Elms are finest in the valley. The twelve last trees measure in circumference, on the right side, beginning at the end, 14ft. 4in.; 12ft. 9in.; 11ft.; 13ft. 4in.; 12ft. 8in.; and 10ft.; and on the left side, in the same order, 9ft. 10in.; 13ft.; 11ft. 5in.; 12ft. 1in.; 10ft. 8in.; and 11ft. 2in.; whilst their height is about 90ft. The Scotch Firs are not of great size (6ft.; 7ft. 3in.; 8ft.; 7ft, 3in.; 8ft.; 5ft. 5in.; 7ft. 4in.; 6ft. 11in.; and 7ft. 6in. in girth), but they are drawn up into very picturesque forms. This part of the avenue is very striking, and whether the dark foliage of the Firs is seen in marked contrast with light-green leaves of the Elms, with which their bright cinnamon coloured stems harmonize so well; or whether when the winter has left bare the handsome rugged forms of these fine old trees and the Scotch Firs are fully seen; it is extremely interesting and picturesque.

There are other fine and lofty Elms in the approach from the Lawn meadow, in girth 12ft.; 12ft. 1in.; and 12ft. 9in.; which must have formed originally one side of another avenue approaching the house from the south:—since an old map of the Estate in the possession of Mr. Davies shows four avenues from the four quarters. It is a quaintly painted map of a hundred years ago. No trees of the avenues from the east and west remain—unless perchance the one from the west is represented by an Elm in the garden field or paddock by the canal 14ft. 1in. in circumference. In this paddock is the finest Wych Elm to be found in the county. It is a remarkably well grown even balanced tree. Its trunk is columnar with fine northern buttresses, and at 5 feet from the ground it gives the measurement of 18 feet 10 inches in circumference. It keeps its central axis well up into the tree and its branches droop well on every side as is the wont of this graceful tree.

The garden in front of the house is shut in from the west in the most effectual manner by a row of Yew trees meant to be clipped originally doubtless, and by a hedge of the most substantial character, which is kept so by clipping. The way in which this hedge has been varied, and concealed, leaves nothing to be desired. The great bane of this country, the horrible west wind, is effectually turned aside by it.

A Deodar Cedar, of good and graceful character, is growing well toward

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this side of the lawn. It has been planted 30 years at least, is now some 30 feet high, and its trunk has the circumference of 3 feet 2 inches.

On the east side, and slightly to the south too, a grand belt of lofty Elms closely planted together forms beneath them that wilderness of pleasant shade which should be close at hand in every well considered pleasure ground. An excellent finish is given to the cluster by a fine Silver Fir which towers above them all to reach the height of some 120 or 125 feet, and which can be seen from a considerable distance by those who travel the high road from Pembridge to Kington. Its fine bole—would that it could be more shewn towards the lawn—gives the large circumference of 11 feet 9 inches, at 5 feet from the ground. It is a grand tree, and gives its character to the grounds, as such a tree must ever do.

Here, as nearly everywhere else, when trees grow well, though thinly planted at first, they get too thick as they increase in size, and so it comes to pass that a casual observer says coolly, "*Cut them down!*" As if it was an easy thing to do, when you have coaxed and watched them day by day and year after year, until the trees have rewarded your care by growing well, and every bough has gained a hold on your affections. "*Cut them down!*" Your commissioner sympathises deeply with the effort it must cost to remove a single tree thus cherished, and he will only wish now that the fine Red Cedar, the nearest to the house of the two, were 50 yards away to the left where its handsome presence would be gladly welcomed. "*Cut them down*" Yes! No doubt there is reason in it; and so your Commissioner steels his nerves.

To a critical eye, one that rejoices in broad sweeps of greensward, never tires in watching the varied effects of sunshine and cloud upon it, and ever admires afresh the charming lights and shadows from the oblique rays of a rising or setting sun upon its smooth green surface, the house grounds of Moor Court are too much closed in by trees. It longs for vistas, not only to let in broad bands of skylight, but also to admit much more of the wide space of outer lawn which is now shut out. A small opening has been cut through to the east with excellent effect, albeit the boughs are yearly dropping down and spreading out to contract it. But surely another due south could be made with even greater advantage, by removing some of the tall young Elms there which seem to be growing up in gallant rivalry of the Silver Fir itself.*

Through the opening to the east an Oak of picturesque form—and made more so by a dead bough or two—is let in to the view. A noisy colony of starlings made great objections when the tape was put round the bole and gave the circumference of 14ft. 1in. There is seen from this opening also a *Sequoia Wellingtonia*, which is growing well, of which it may be interesting hereafter if accurate notes are taken now. It has been planted twelve years, is now 16 feet

* Since this report was written the Elms have been "falled," two of them actually measuring over 96 feet, and the other above 100 feet in height. A rosery well sheltered by a low laurel hedge now occupies the place of the tall young Elms just mentioned.

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in height, at one foot from the ground the trunk measures 2ft. 7in., and it has a foliage diameter of 8ft.

The "Lower Meadow" in front of the house in the old maps and deeds of the estate is called the Drummercraft," probably from the Anglo-Saxon "Dómne Croft"—domini prediolum, "The master's meadow."

In the middle of this meadow, fronting the house, are a dozen Walnut trees. They form a short avenue as if at one time they too were intended for an approach to the house. As they are thus seen in prospective, they form a very handsome group, with lofty heads, strong gracefully-spreading branches, and the pale deeply furrowed bark, peculiar to the Walnut. The oldest and largest trees are nearest to the house, and gave these dimensions in girth: 10ft. 9in.; 9ft. 9in.; 12ft. 3in.; 11ft. 8in.; 10ft. 7in.; and 8ft. 7in.; and were judged to be from 60 to 70 feet in height.

At the beginning of this century they were in great danger. Walnut wood for gun-stocks was in urgent demand, and a long price was offered for these trees, but the late Mr. Davies resisted the temptation. He valued them too highly as ornamental trees to lose them at any price, and so "Diana's Grove" was spared. Of late years, however, it has happily been invaded in another way, for now in their branches—

> "Rooks unnumbered build their nests,
> Deliberate birds and prudent all;
> Their notes indeed are harsh and rude,
> But they're a social multitude."

It is quite clear that Crabbe did not understand the rook language, or he would have said something in praise of its variety, and the musical sweetness of its softer guttural notes. These trees, alas! are also tenanted by woodpeckers, starlings, and jackdaws, and lively though they too may be, they afford a painful proof of the trees being past their prime.

That the valley is admirably adapted for timber growing the measurements of the trees already given prove, and still more clearly does a walk through it for it abounds in Oaks that are already getting "sizeable"—trees that make a timber dealer's eyes sparkle, "quartering 2 to 2½," and running their boles well up into their branches, "useful for everything." Occasionally, as in the Yeld meadow, one falls in with a pollard that gives over 15ft. in girth, but beyond those which have already been given there are no trees remarkable for great size.

In the course of his perambulations your Commissioner came upon a young plantation of Larch to the north of the valley, hard by the farm of Cotmore. He was reminded by it of a fine plantation of Oak he once met with where the trees some thirty years old all of them sent up straight boles from 20 to 30 feet high without a branch, and on enquiring how they had been educated in this very proper manner, he was told that they were self-sown acorns in a young plantation of Larch. This indeed has long been a recognised method of growing Oak timber. The crop of Larch is first gathered at intervals, and a still more

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valuable crop of Oak remains on the ground. It is not now intended, however, to recommend with old Tusser—

"Sow acornes ye owners that timber do love."

Though this might be done, but it is suggested that young Spanish Chesnut trees should be planted in the many places where the Larch must have failed during the late dry summer. Let these Spanish Chesnuts be thus properly educated, too, and then, if tree for tree, and space for space, they are not one-third more valuable than the Larch in the year 1890, your Commissioner will forfeit a silver threepence if the fact is proved to him on the spot. "If you are planting for profit, on good ground," said an old Herefordshire timber-dealer in a confidential way, "plant Sweet Chesnuts. They are much quicker in growth, and up to 30 years old are more valuable than Oak itself."

Moor Court, in its retirement, is certainly very umbrageous. The music of tree foliage is never absent. To each breath of wind that sweeps over the valley the branches ever

"A ceaseless utterance give
To soothe the fantasies of waking hearts
Or lull the dreams of night."

There are, too, attaching to the place certain signs of a lost history that give it a peculiar interest. What means that small canal, apropos to nothing that runs straight along the paddock and under the carriage road, being an artificial continuation of the Curl brook, which runs from Elsdon and Lionshall through the Moor Court meadows? On the lawn, too, are certain double grooves in the turf cut in an angular form, and carefully renewed from time immemorial. A mulberry tree occupies the centre, to which they all tend. This tree is of no great size, but rugged and knarled enough to be of considerable age. What were the lawn games these turf grooves indicate, and who played them? It may be that they were not intended for any games, but simply indicated paths to be trimly shorn, leaving triangular plots within their lines which were suffered to grow more wildly. It is said that such was the case at an old mansion of Flemish character in Surrey, where, and where only, the same converging turf tracks as at Moor Court are to be seen. The house itself, altered and enlarged again and again, tells nothing more than may be surmised from its secluded position in the valley. As might be expected, however, some rays of light are thrown upon its history by the legal records and documents connected with it.

Here is a sketch of its history so far as can be made out from this source and from the consideration of certain frames and pictures which have descended with the Estate, and which like it have lost their authentic history.

In the imperfect will of Walter Devereux, Earl of Essex, dated June 14, 1576, and preserved in the Prerogative Court of the diocese of Dublin, among the lands devised are the Manors of Webley, Lionhales, Moor Court, and Byford, com. Hereford: and when the litigation arising out of the will of the Earl of Essex, the Parliamentarian general, was finally settled, his sister, the Marchioness

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of Hertford, afterwards Duchess of Somerset, had for her moiety, amongst other Herefordshire property, Pembridge, Earl's Land, Lyonshall, Murcutt (the local name of Moor Court to this day) and Weobley. It would seem therefore that at least the manor was in the hands of the Devereux family up to the time of Charles the 2nd's restoration. [See Lives and Letters of the Devereux, Earls of Essex, by Hon. W. B. Devereux (Murray, 1853), vol. II., 474 and 483.]

It would seem, however, that previous to the restoration, Moor Court was owned by the Vaughan family, and the Christian names mentioned in the deeds and documents lead to the inference that these Vaughans were of the Bredwardine and Hergest stock. From the Vaughans it passed by marriage to the Steads; and the last of the Steads, a daughter, carried it by marriage into the family of James, with which it remained until purchased by the late James Davies, of Moor Court, in the early years of this century. Sibylla and Walter seem to be favourite Christian names in all the three families. The first James mentioned was a vintner of London; the seller of the estate was father of the too-celebrated Edwin James, Q.C. The Vaughans and James's, of Moor Court, have contributed to the list of the High Sheriffs of the county of Hereford, and the names of Pember, of Elsdon and Warnecombe Pierrepoint—perhaps a brother of the founder of Lucton School—occur as witnesses to deeds and indentures relative to the property in their day.

It may be that the four very handsomely-formed three-quarter length life-size portraits in the drawing-room, with a mirror of equally elaborate carving, could, if they had but a voice, unfold the history of the owners of the property, or, at any rate, explain their connection with one or other of them. The portraits are undoubtedly by a Flemish master; the date on one of them would point to Sir Peter Lely, or a pupil of his. The frames are pronounced by a very experienced judge to be Venetian. All are elaborately carved in a seemingly soft wood, and are gilded over. The greatest prodigality of the graver's fancy has been bestowed on the portrait of a warrior, with long flowing hair of raven hue, in full armour, and with his plumed helmet and rich velvet cloak beside him. Carven upon the frame are a variety of implements of war, instruments of martial music, and divers other accompaniments of military show. The freedom with which the carver wrought is seen in the fact that the instruments and implements, the drums, coats of mail, helmets, pikes, bows, on the one side of the frame, are matched by others corresponding in purpose, but not in shape or fashion on the other side. The artist could not repeat himself. It is the same with the frame of the mirror, which at its top and at its base has figures of nymphs and Muses, whilst the sides are profusely covered with lighter instruments of music, and all the diverse requisites for a lady's toilette. This frame has one or two features which connect it with the portrait of a lady of rank, opposite to the warrior before-mentioned. One is the crest surmounting the frame, a lion rampant, and the other a helmet, introduced heraldically, this helmet facing front, open, but guarded by five bars, and so bespeaking for its

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owner the rank of duke or marquis. This same lion is wrought in jewels on the amber dress of the lady above-mentioned, and it also surmounts the frame, which has a ducal coronet above it. This last clue points to the Lady Frances Devereux, wife of William Seymour, Marquis of Hertford, and Duke of Somerset, as the lady in the picture, though the crest does not suit this surmise. She is represented with fair hair in ringlets, light complexion and eyes, with pearl necklace and bracelets, and amber dress. The warrior opposite to her, who has been already described, has a viscount's coronet surmounting the frame. There is a portrait of Frances, Duchess of Somerset at Petworth, but it does not correspond with the portrait described. Besides the portraits of the warrior and lady are two others of equal size, and bespeaking equal skill in their artist; one of an elderly lady in black, with collar and cuffs of white muslin, and without any ornaments whatever. One should surmise that she was a widow, but there is no sign of a wedding ring, though that Mr. George Scharf, of the National Portrait Gallery, says, proves nothing in portraits of this date. Opposite to her is the portrait of a noble-faced old man with grey hair, flowing black velvet gown and cap, a pair of compases in hand, a chest before him, and beside him a globe, whereon certain countries, Lapland among them, are prominently figured. His features are considered to resemble those of the warrior, who may have been his son; and this portrait is perhaps the most striking of the collection, but it has proved hitherto in vain to unravel the enigma as to who these worthies are, and in any wise to connect them with the estate. Lady Theresa Lewis had a guess—it amounted to nothing more—that the old man might have been Sir Francis Walsingham, Queen Elizabeth's Secretary of State, who was grandfather to Lady Frances Devereux, Duchess of Somerset aforementioned; and Mr. George Scharf infers that the warrior and the younger lady are persons of the highest rank, both from the style of painting and the elaborate frames, and is inclined to think that the other pair are portraits of foreigners connected with the family. Photographs of the four are deposited at the Kensington Museum. The pictures themselves are extremely interesting to all who are curious in old portraits of family histories, and will be gladly shown at any time. They were in a very neglected state when the old manor house and property passed by sale to the late James Davies, of Moor Court.

Weaving these threads of information together it is not difficult to find an explanation which suits them and adapts itself readily, as well to the other peculiarities of the place, as to the known history of the district. Why should not Moor Court have been the abode of one of those Flemish families who are known to have taken up their residence in this neighbourhood. The man who occupied the house for a considerable time, even if he neither owned nor built it, may have been the proprietor of the cloth works of Leominster or Kington, who in the retired seclusion of this valley surrounded himself with happy associations of the Fatherland. It is easy to fancy the pride he would take in his farm buildings, which are very close to the house, the pleasure he would take in his

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garden, his fishponds, and especially in the construction of the canal, which, while he could utilize it as a stew pond, would ever remind him of olden times. In fancy one sees a terrace walk beside the canal, and at the far end of it a bright painted summer-house, with the motto, "Lust und rast," over the entrance. Here, in the cool evening of summer, after the day's work was over, he would promenade with his family, and fully realize its quiet pleasures.

> "At secura quies et nescia fallere vita
> Dives opum variarum, at latis otia fundis,
> Speluncæ vivique lacus, at frigida Tempe
> Mugitusque boum mollesque sub arbore somni
> Non absunt."—*Virgil, Georg.*, xi., 467."

We may still take a further flight of fancy. As the good man became attached to the place, and as his trees grew and his factories flourished, it may readily be imagined that he would take the earliest opportunity to import the cattle of his own country. In old Flemish pictures the cattle introduced are frequently white-faced, and why should not—the pen trembles to write it!—why should not these very Flemish cattle have been the original source of our famed breed of Herefords. Be this as it may, certain it is that this district of the county has ever been the head-quarters of the purest blood, and that the Moor Court Estate produced the celebrated bull "Cotmore" who was so renowned a father of Herefords. He was bred by Mr. Thomas Jefferies, a name well-known amongst the successful breeders of the Herefordshire cattle, at the adjoining farm of Cotmore. A likeness of its scion the bull "Cotmore" may be seen at the farm house, and the house itself, too, is worth a visit. It is one of those black and white timbered houses, with curious old gables of the style so characteristic of old Herefordshire.

Space permits not to dwell further on such imagineings. Let us leave the cool shades of Moor Court, in the odour of its Flemish formalities, if such they be, and bearing in mind the divergent avenues, the clipped hedges, and formal paths of olden times, with Bishop Mant's lines:

> "In much, though now fastidious pride
> Our fathers Gothic taste deride;
> Yet still in much that lingering bears
> The vestige of departed years,
> I love that antiquated taste!
> The trim and stately garden graced
> With vistas deep which through and through
> Lead the pleased eye; the avenues
> Of loftier structure and more wide
> Of space, but clothed on either side
> With branching arms, a cool retreat
> For musing 'mid the summer heat:
> A winter walk secure and warm,
> And sheltered from the northern storm,
> Of dark green cyprus, darker yew,
> Or holly's lighter, livelier hue!"

THE WHITTERN LARCH.—This is a very singular tree. Its massive contorted roots are above the ground level, and the tree itself seems lifted up by

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them. At 18 inches from the ground the circumference of this root-mass is 26ft. 9in. It is, therefore, not only most curious in growth, but its trunk is also of very remarkable size for Larch. There is one in this county to be mentioned shortly, at Brampton Bryan, of a larger size, and at Foxley, the Rev. Sir George H. Cornewall found one measuring 11ft. 1in., but they are seldom so large.

There is also, at The Whittern, a very close-grown, picturesque cluster of Scotch Firs, two well-growing Cedars, and many interesting Conifers. Young and old in that picturesque spot, tell the same tale of care bestowed upon them and grow their best to reward their owner.

SHOBDON COURT.

Many very fine trees are to be found about Shobdon Court. This ancient seat is surrounded by a great deal of pasture land, most picturesquely varied and uneven, and dotted with noble groups of trees, especially Oaks and Chestnuts. Besides these, there are belts and plantations of all ages, and comprising a great variety of trees. Through the Park and across the fields behind it, extends a sort of avenue of parallel groups of Scotch Firs, which is continued through the woods and up the steep ascent to the very summit of Shobdon Hill, overhanging the narrow valley of the Lug. Many very old Yews are scattered about the eastern side of the Park and the adjoining part of the grounds, near those quaintly carved arches said to be Saxon, which are the sole remains of the ancient church. These Yew trees extend at intervals down the slope to the village, which lies at some distance below. Some of them are very large, and most of them much injured by time and weather. One of the most vigorous of them—a tree with a sound, straight bole—measures 13ft. in girth.

Down below the House, between it and the pools, where it is said the pleasure grounds extended in former days, the Lime, the Evergreen Oak, and the Cedar flourish in great luxuriance. They are extremely tall, as is usual with trees so situated, at the bottom of the steep declivity. One Cedar there is a very magnificent tree, with a crowd of huge branches all tending upwards, and then spreading out horizontally in a very picturesque way. It is one of the very finest Cedars in Great Britain, since it has the circumference of 20ft. 4in., which is considerably larger than that of any other tree recorded in Loudon, Strutt, or the other leading authorities on tree growth.

Not far from this Cedar, and close to a little covert, there is a very old Oak, much shattered, but measuring 23ft. 8in. A very picturesque path leads from this spot to the little village of Easthampton, crossing the grounds at some little distance from the east front of the house. On the knoll near this path stands a portico, a rustic temple in the taste of the last century, surrounded by noble

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Oaks and Sweet Chestnuts. One of these Chestnuts measures 15ft. 2in. But the largest Sweet Chestnuts are just inside the garden, near the church. One of these measures 19ft. 6in. and is a very fine tree.

A little further on, to the left of Easthampton, there is a long, narrow quarry of large size. In the midst of this, on the edge of a steep bank, stands a very fine Oak, with an enormous load of very long branches. In a meadow opposite the farm-house, at Easthampton, stands another fine tree, "the V Oak," perhaps the very finest hereabouts. It is a sound, healthy, well-balanced tree, and grows on an open spot, well adapted for displaying it. It measures 20ft. 6in., and the trunk, after rising to a considerable height, diverges into two principal limbs, in the shape of the letter "V." There used to be some very large Oaks near the eastern boundary of the Park, both inside and outside; but none of any very great size are left, though there are still a great number of trees which, elsewhere but in Herefordshire, would be remarkable. There is one just inside the Park fence about 18ft. in girth, another just outside about 16ft., and so on; trees in full vigour, and covering a wide extent of ground.

A still larger Oak remains to be mentioned: it is near the turnpike road from Presteign to Ludlow, about half-a-mile from the village, in the hollow meadow. Its upper branches are battered and torn, and seem to have been struck by lightning; its trunk is hollow; its limbs are broken; but it measures 26ft. in circumference, and is a most picturesque object; although, from its situation, it attracts no notice unless seen near at hand.

THE GATLEY OAK grows in the Great Orchard, at Gatley Park. It has as yet no great size, but as a fine upright symmetrical tree in healthy luxuriance it is worthy of record, especially since a long price has been refused for it, and it is not, therefore, likely to be destroyed. It measures 13 ft. 4 in. in girth, at 5ft. from the ground; 12 ft. 4 in., at 18 ft. high; and it was computed to have a circumference of about 9 ft. at the height of 39 ft. from the ground. It has a diametric foliage spread of about 72 ft., and at a rough estimate it contains about 360 feet of timber.

THE WILLEY HALL OAK is an extremely fine picturesque tree. The old "Willey Oak," of the Ordinance map, has long since disappeared without leaving any record of its size. This tree grows about half a mile from that one, near the buildings belonging to Willey Hall. It is an upright tree with a perfect trunk, but all the upper part of it is dead. At 5 ft. from the ground it measures 22 ft. in circumference, and at 25 ft. it would still girth about 15 ft. The dead boughs at the top do not now reach above 45 ft. in height. It is indeed a noble ruin. At one time £100 is said to have been refused for it, and it might be worth all the money now to an artist, if it was but in a more approachable position.

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BRAMPTON BRIAN PARK

Is noted for its fine timber, its varied scenery, and above and beyond all, perhaps, for the great number and variety of its picturesque trees. A wise judgment here leaves the beauty and grandeur of tree-growth to be well contrasted with the wild havoc of the storm; so that the pleasure of a ramble up its steep slopes, or through its shady dingles, is greatly heightened by the lesson so quietly enforced:

"Shadow and shine is life, flower and thorn."

The thoughtful mind sets itself intuitively to read the record of centuries written here, and tries to trace the effects of that violent storm of September 3rd, 1658, at the time of Cromwell's death, which is known to have been very destructive here, breaking and uprooting the trees in a broad band across the whole Park. Clarendon and all historians notice this violent tempest, which seemed, indeed, as if

"Nature herself took notice of his death."

And his partisans and his enemies did not fail each to interpret it as a confirmation of their own particular prejudices. Waller in his poem on the death of the Lord Protector, says for his friends:—

"We must resign. Heaven his great soul does claim,
In storms as loud as his immortal fame;
His dying groans, his last breath shakes our isle,
And trees uncut fall for his funeral pile."

The Royalists read this great disturbance of the elements in rather a different sense, and in this particular instance the saying has come down that "the devil dragged Cromwell across Brampton Brian Park to spite the Harleys." Sir Edward Harley, then in possession, quarrelled with Cromwell, though a Roundhead, on the King's death, and they became bitter enemies. After the great storm which occurred when he died, Sir Edward wrote to a friend, "I wish the devil had taken him any other way than through my Park, for, not content with doing me all the mischief he could while alive, he has knocked over some of my finest trees in his progress downwards."

Be this as it may, there is certainly no reason to doubt the violence of this historical tempest in the Park; nor would it be difficult to point out traces of storm destruction there that may well date thus far back. For example, the grand old Oak of all *(P. pedunculata)* that grows on the hill side of the Laugh Lady Dingle, may have met at that time with the great misfortune of its life. Its top has been broken off, its bole has been riven asunder, and it now presents a hollow stem divided into three sections, and each one has so far recovered itself as to be everywhere luxuriant. Seven beasts were lost in a snow storm some years since, and after a long hunt for them they were all found within the hollow of this tree, where they had taken refuge and were unable to extricate themselves. At 5ft. from the ground it gives the large circumference of 30ft., but

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the measurement is not true, since the rent on two sides reaches the ground, and gapes widely on one of them.

This dingle takes its name from a spring called the "Laugh Lady Well," which rises in a pretty spot at the foot of the hill. It has apparently lost its legend, and sadly wants one.

The Woodyard Oak *(Q. sessiliflora)*, 17ft. 9in. in girth, may have lost its top and main branches in the Cromwellian hurricane. The fine old Oak on the Southern hill *(Q. sess.)*, giving 22ft. 10. in fine measurement at 5ft. from the ground, and spreading out at the ground level to no less than 42ft., was possibly battered severely then: so, too, perchance, were three other Oaks on the hill, measuring 14ft. 4in., 20ft. 3in., and 18ft. in girth, grievously injured by it, for they carry grief scars centuries old. All of them are more or less weird, hollow, and broken, and all of them so much burrowed under as to offer a secure and safe refuge for rabbits or foxes.

Setting such speculations aside, there are two or three other Oaks which though much younger are still old enough, or have a position to keep them from the cool calculating clutches of the timber dealer, and thus demand a notice. By the Park cottage is a very fine grown Oak *(Q. sessiliflora)* which has a circumference of 17ft. 2in.; but unfortunately decay has set in, for a fine *Polyporus dryadeus* grew from the trunk near the ground, and gave this information. How pretty and picturesque this cottage is; how well its grounds have been planted with roses; how exquisite was the view from it on the day of sunshine and cloud when these notes were taken, with a fine herd of stags in the foreground, space permits not to tell, for when the Oak at the new keeper's house—the Meat-safe Oak—is measured, 12ft. 8in. in girth, and the picturesque Beech trees passed by (having been already described in Mr. Woodhouse's paper), there still remains the long row of fine Sweet Chestnut trees to be given.

These Sweet Chestnut trees are believed to be about 150 or 160 years old. They are said to have been brought from Eywood. They are many of them of great interest and beauty, and some show well the beautifully reticulated bark occasionally observed in this tree. Here are a series of their measurements: 16ft. swelling out by protuberances, twisted, knotted, and knarled, to 19ft. 9in.: then comes an interesting group of four tall stemmed trees 13.9; 16.4; 13.3; and 13.5. Then in a single line they strike away to the head of the dingle, and the tape thrown round several gave these figures:—11ft. 10in.; 17.8 a very fine tree indeed; 13.9; 13 1; 16.10; 13.7; 18 3; 16.7 until the tree at the extreme corner is reached, which from its single upright tall stem and good growth is the finest of all and measured 16ft. 9in in circumference.

This narrow bend of the dingle was very picturesque and interesting. An Ash tree measured 13ft. in girth; and higher up a very fine Wych Elm carried up its trunk well amidst its drooping branches, and gave the large measurement of 18ft. 8in. in circumference.

A doe with her fawn here jumped up suddenly from the brake, and put

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an end to these observations, for time was up and there was nothing for it but to "make tracks" as speedily as possible.

By the way, there is a Beech tree below the steep hill on the north side of the Park which deserves notice. It is a fine graceful tree, very lofty, and carries its stem well up in the branches. Its circumference is not easy to be got, for it stands a few yards outside the boundary; and Park palings, 5 or 6 feet high, on the top of a bank, well fortified with angles and corners, and long sharp splinters, and moreover of doubtful strength, are obstacles not very easy to be surmounted. Your Commissioner however was equal to the occasion, and has the honour to inform you, that the girth of the tree was 16ft. 8in. at 5ft. from the ground, and much more at the ground level.

In front of Brampton Hall in the village are three very fine Lime trees, measuring respectively 15ft. 9in.; 17ft.; and 16ft. These trees were probably planted at the end of the 17th century, shortly after the Hall was built, (1661-5,) by Sir Edward Harley, and are therefore probably more than 200 years old. A very curious Larch tree is also growing in the Hall grounds. When in full vigour and growth this tree lost somehow or other its head at 10ft. from the ground, and since that time has thrown all its growth into its lateral branches, whilst the stem has swollen to the very extraordinary circumference of 14ft. It is a very interesting, picturesque tree. Oh you owners of formal young Larch trees from 20ft. to 30ft. high, growing freely in situations where they are meant to remain as ornamental trees, cut off five or six feet from their tops next November. It will make them throw their growth into side shoots in the most graceful form, and by cutting obliquely from the bough you wish to grow, you may partly regulate the direction they will take. Off with their tops, and your successors of cultivated taste will, by their admiration of the trees, pay an unconscious tribute to your memory.

It was a little disappointment to find that the old Castle with all its interesting associations was situated in the village, and not in the Park. One or two of the old walls were just caught sight of on the road to Coxwell Knoll. Castles of old generally seem to have been situated near a village or town and not in the Park. It still is so in many memorable instances. Windsor Castle closely adjoins the town; the Great Park begins at a distance of at least half a mile; and the Home Park at some little distance. Berkeley Castle is at a considerable distance from its very ancient Park. And even in this county Moccas Park is distant from the House, and Hampton Court Park begins nearly half a mile from the Court; just as its better known namesake closely adjoins the town of Hampton, and is completely detached both in name and situation from Bushy Park. The ambition to live apart in solitary state, approached through long avenues, and disturbed by no intruders, seems to be of comparatively modern date; as perhaps may also be said with regard to the safety of doing so.

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CROFT AMBURY AND CROFT CASTLE.

Taking heron's flight from Brampton Brian Park over the ancient forest of Deerfold (—a profound salaam to your respected Club anent its discoveries there!—) and the British camp of Croft Ambury is soon reached. It is one of the most beautiful and interesting spots in the county. Good King Ambrosius chose well the site of his camp, and spared no labour in making its elliptical ditches and ramparts The views from it are most extensive, thirteen counties, it is said, may be looked into; and it has, moreover, a geological interest peculiar to itself. None of these attractions concern us now, but there is still another, and that is the fine trees that grow there.

In 1864 the Woolhope Club visited this district. There were several fine Beech trees growing in the trenches, with the circumference of 13, 14, and 15 feet. How valuable they would be if beech timber did not chance to be "fit for everything and good for nothing." As La Fontaine makes his wood carver say to the log before him,

> "Sera-t-il dieu, table, ou cuvette?"
> What shall I make of it? ay, that's the rub;
> A god, a table, or a salt fish tub?

At this time there was also some Ash trees that gave the circumference of 11ft.; 10ft.; 9ft. 9in.; and 16ft. 2in. The well-known "BOWER OAK" is there also, and around it a seat is placed. It is a triple-stemmed oak, and its boughs trail on the ground on all sides. The three stems then measured 12ft. 2in.; 9ft. 5in.; and 9ft. 9 in. in girth, and had a diametric foliage spread of 108 feet. It is a very remarkable tree, and taken together, the three stems give a considerable amount of timber. The shade, security, and seclusion of the seat at its trunk is delightful. It should be called "The Lovers' Oak," from the romantic scenes that have occurred there. Few trees have left more indelible impressions on young memories.

The dingle which leads down to the valley in which Croft Castle is situated becomes narrow and steep, and is very celebrated for the great length and straightness of the timber it grows. As an example, one young Oak there presented a clear straight bole of 90 feet, and was estimated, nevertheless, to contain only 140 cubic feet of timber. Loudon mentions that "the oak here will grow to the extraordinary height of 120 feet" (p. 1840). Several trees of this kind, it was stated, were sold from this dingle at £40 each to make the piles used in the construction of the Birkenhead Docks.

There was a group of some 30 or 40 Larch trees in the dingle which, though of no very great girth, the tape made six of the best 8 ft. 2 in.; 9 ft. 10 in.; 7 ft. 6 in.; 9 ft.; 9 ft. 7 in.; and 8 ft. 4 in.; were certainly not less than 120 to 130 ft. high. Their effect was excellent in the landscape, a tree cathedral in the dingle.

The picturesque beauties of this dingle are very great and tempting to dwell upon, but the description must give place to the exact measurement of

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some of the many remarkable trees which adorn the grounds of Croft Castle, and give substantial proof of the richness of the valley in which it is situated.

Passing up the avenue of closely-planted Beech trees, which must be left to the artist, to the other side of the castle, the "GARDEN OAK" cannot fail to attract the attention it deserves. In 1864 it gave in fair measurement a circumference of 24 feet. It is a pollard tree, but massive and noble, and gives off its branches well. It has lost two large boughs on the western side.

THE CROFT OAK, which has so long been celebrated, is now but a decayed and broken trunk, some 30 feet high. The circumference at 5 ft. so far as it could be taken, was 34 ft., but the trunk is covered with excrescences, and the quantity of small twigs that shoot out from every side, prevent the possibility of taking any fair measurement at all. It presents, nevertheless, the remains of a tree of very remarkable size.

There are three other pollard Oak trees in the immediate neighbourhood, all of them grand in growth. They gave the measurements of 20 ft.; 22 ft. 4 in.; and 25 ft. 10 in. They are all more or less old and picturesque, and each one of them would fairly merit a special description, as they would certainly reward a special visit.

An Elm tree on the west front of the Castle measured 14 feet 2 inches in girth and was carefully estimated to be 120 feet in height. It was a healthy well balanced tree with a foliage spread N. and E. of 72 feet, and E. and W. of 78 feet.

The trees, however, for which the grounds of Croft Castle are most celebrated are the SPANISH CHESTNUTS and for those who are fond of trees they are worth going any reasonable distance to see. Loudon, in his "Arboretum," says of them: "In Herefordshire, at Croft Castle, are some very remarkable Chestnuts; one of which is 80 feet high, diameter of the trunk 8 feet 6 inches (circumference therefore 25 feet 6 inches), and of the head 112 feet. This is probably the largest Chestnut in England. There is another Chestnut at Croft Castle which is 78 feet high, diameter of trunk 8 feet (girth 24 feet), and of the head 81 feet, and others of nearly equal dimensions." (Vol. iii. p. 2,001).

Perhaps the most remarkable group of the Spanish Chestnuts are the 14 trees at the west end of a field near the drive. The circumferences of these trees as taken on the visit of the Woolhope Club there May 26th, 1864, are as follows: 16 feet 3 inches; 15.10; 20.8; 12.2; 18.10; 17.11; 16.10; 20.3; 14.3; 17.7; 16.5; 18.10; 17; and 20 feet 5 inches. These trees are said to have been planted by Dr. Herbert Croft, Bishop of Hereford (1662-91), after the Restoration. But this appears very doubtful, since Bishop Croft does not seem to have resided at Croft Castle, though he belonged to the ancient family of the Crofts. The Chestnut trees must be seen to be appreciated, for large as these measurements of some of them are, they give no idea of the grandeur and beauty of the trees

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themselves and the branches they give off. The more they are examined the more admiration they excite. To give a single observation. One branch given off at right angles to the bole of the third tree given in these measurements (20 feet 8 inches), at 6 feet from the trunk had itself a circumference of 9 feet, and carried an enormous spray of foliage to a distance of 54 feet. What must the weight be of such a branch in full foliage under a heavy storm with a gale of wind? Try it mathematicians!

THE BATTLE FIELD OAK, near Mortimer's Cross, is a very interesting tree, though of no great size. It is probably the only tree remaining on the field of battle which was there on that "bloody Candlemas Day" (Feb. 2nd, 1461), so glorious for Herefordshire, which placed the young Lord of Wigmore upon the throne, and was so fatal to the Lancastrians. The tree occupies about the centre of the Lancastrian position, and may therefore very reasonably be supposed to have given its shelter to Sir Owen Tudor and his staff for the night before the battle. It now forms the boundary mark of the four parishes of Kingsland, Lucton, Aymestrey, and Shobden, and may certainly be said to figure on more legal documents than any other tree in the county. It has a circumference of 14ft. 2in., is quite hollow, and for the most part dead, though it has still living branches to the north and east.

THE NONUPTON OAK.—The oak on the brow of the hill at Nonupton, or Nunn's Upton, near Little Hereford, has been noted from time immemorial as a very remarkable tree. Its prominent position made it a landmark of the district. It was probably standing there before the Norman conquest, and has been for centuries perhaps the last remaining tree of the primæval forest. From the name of the hamlet it is fair to infer that the manor belonged at one time to one of the border convents. It was formerly a very noble tree, carrying it bole straightly and well up into its branches, as may be seen from the pictures of it. At 4½ feet from the ground, when standing, it measured 33 feet in circumferance, and at the ground level this was increased to 50 feet. The tree had long been hollow, and is said at one time to have concealed "42 sheep—that is, 20 ewes and their lambs and two barren ewes." Pic-nic parties often resorted to it from considerable distances. The tree was alive and covered itself with foliage up to the year 1850 or 1851, when one Sunday evening it was set on fire by accident or design. It was evidently suspected to have been done from mischief, as so often happens to old trees, for Mr. Edmunds, of the Moor, its owner, offered a reward of £20 to discover the perpetrator. The fire was discovered by the shepherd, about nine o'clock in the evening. It was found impossible to put it out, and this noble tree had therefore to be felled at once, to save it from complete destruction.

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It now lies dead, a wreck upon the ground, shrivelled and dry. As it lies it measures 60 feet in length, and at about five feet from the base it has a girth of 26 ft. 8 in. It is hollow throughout, and the diameter of the hollow at the bottom is 12 ft. 6 in. The trunk divided at 25 ft. from the ground, and still at three feet beyond the division, the main stem measures 13 ft. in circumference. Let us say with Sir Humphry Davy—

> "Now the huge trunk whose bare and forked arms
> Pierced the mid sky lies prone, shall bud no more
> Still let the massy ruin, like the bones
> Of some majestic hero, be preserved
> Unviolated and revered."

In the hedgerow of the same field is a remarkably fine growing Oak—which may be called the "Young Nonupton Oak"—which measures 17 ft. 9 in. in circumference, but though so good a tree it will never reach the grandeur of the old one.

THE PULPIT OAK OF UPTON.—On the neighbouring hill to that on which the great oak of Nonupton grew is another remarkable tree, "The Pulpit Oak." It is a hollow pollard tree, covered with excrescences, and open on one side. It is partly ivy clad, and has an abundance of spray shooting from it. Its circumference as near as could be taken was 18 ft. 6 in., and the height of the trunk itself only 9 ft. high. Its history and traditions seem lost, nor does it appear to be connected in any way with the "Pulpit Farm" in the valley half a mile off. The name it bears, however, with its position, prove it to have been one of those "GOSPEL OAKS" of which several examples still exist in different counties. It is on the boundary line between the parishes of St. Michael, belonging to Old Tenbury, and Little Hereford, and on that also of the two counties of Herefordshire and Worcestershire. When the ancient custom of walking the parish boundaries once a year was in vogue this tree was very probably one of the stations where passages from the Gospels were recited and prayers made.

> "That every man might keep his own possessions
> Our fathers used, in reverend processions,
> (With zealous prayers, and with praiseful cheere),
> To walk their parish limits once a year."

A solemn character was thus given to such trees, and that earthly vows beneath them were judged to be the more solemn, may be inferred from the plaintive injunction Herrick makes one of his lovers utter in his "Hesperides":—

> ——— Dearest, bury me
> Under that holy oke, or GOSPEL TREE;
> Where, though thou see'st not, thou may'st think upon
> Me, when thou yearly go'st Procession."

But surely such a request could only have been properly asked of some gay young member of that office which has descended from remote antiquity—the parish beadle.

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THE EYTON OAK.—In a meadow near the foot bridge over the Lug, called Coxall Bridge, this very remarkable tree is to be found. It is a mere shell of a pollard oak, but of very great size, and it is still very luxuriant from the number of small boughs it gives off. It is shaped somewhat like a flower pot; the smallest circumference is at the ground level, where it measures 26ft., at five feet height it has a girth of 33ft., and at 9ft. high it swells out to 41ft. It is open on the west side to within two feet of the ground. All trace of the great boughs it once may have had is gone, but still its foliage covers an area of 72ft. by 66ft. The hole is about 11ft. high. It is altogether a very interesting tree and well worthy of a visit, although it is open to the apostrophe Cowper addressed to the Yardly Oak:

> "Embowell'd now and of thy ancient self
> Possessing naught but the scoop'd rind."

In a meadow at the Court Farm, Eyton, called the Oak Meadow, were scattered other Oak trees giving the respective girths of 16ft. 6in.; 15ft. 3in.; 14ft. 6in., and 14ft.

THE LONGWORTH ELMS.—In the meadows at Longworth, the seat of E. J. Hutchinson, Esq., in the parish of Lugwardine, the Elms are very fine, and in full beauty and luxuriance. In what is called "The Exchange Field," through which the main approach to the house passes, there are many of them, partly the remains of old avenues and partly standing as single trees. A walk round tape in hand produced the following results of their circumference:—16ft. 2in., a very handsome well balanced tree; 15ft. 2in., spreading out to much more at ground level; 16ft. 10in., has lost some of its large boughs; 15ft.; 15ft. 6in.; 16ft. 5in.; 15ft. 5in.; 15ft.; 14ft. 8in.; until the finest of the number near the entrance gate by the house measured 17ft. 7in. in girth. This tree is very fine, and carries up its main stem for about 70 feet, and attains the height of about 117 feet.

On the croquet lawn by the house four lofty trees form a handsome group, and measure respectively 14ft. 2in.; 12f. 6in.; 10ft. 9in.; and 13ft. 7in. In the Park, a tree which has lost its top measured 15ft. 10in.; another 17ft. 5in.; and still another 17ft. 5in.; but these latter trees are all past their prime, and encourage fungus growth. In the Moat Meadow two others attracted a passing a notice, and were found to measure 15ft. 10in. and 14ft. 3in. respectively.

If the growth of the Elm is a test for the richness of the soil—"A good Elm never grew on bad ground," says the country proverb—happy should be the possessor of Longworth.

LEDBURY ELMS.—Several fine Elms in the Ledbury district have already been noticed in the Transactions. The following additional measurements were

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kindly sent to the Honorary Secretary of the Club by Geo. Masefield, Esq. An Elm in the Square Meadow has a circumference of 14ft. 10in., a bole 40ft. high, and a foliage spread 106ft. in diameter. In the kennel field an Elm has a girth of 17ft., with a bole 30ft. high; and in Wallfield are two more trees which are 14ft. 2in. and 15ft. 1in. in circumstance, and carry up their main stems to the height of 35 feet and 40 feet respectively.

THE KENTCHURCH ELMS.—A long avenue of trees forms the approach to Kentchurch Court, and a noble avenue of fine trees it is. There are also scattered trees in the Park of goodly growth. Here are the girth measurements of the finest: 12ft.; 12ft. 1in.; 12ft. 3in.; 12ft. 4in.; 12ft. 9in.; 13ft. 2in.; 13ft. 6in.; 13ft. 8in.; 13ft. 10in.; 13ft. 11in.; and 14ft. 5in.

THE COWARNE COURT OAK (*Q. pedunculata*).—The bole of this fine old oak still stands erect in the small dingle on the North side of Cowarne Court, the property of Lord Leconfield, where it is railed in for protection. Doubtless it

> "Whilom had been the king of the field,
> And mochel mast to the husband did yield;
> And with his nuts larded many swine,
> But now the gray moss marred his rine."

The lower part of the tree is swollen out by protuberances to the great circumference of 37ft. 8in., at 5 feet from the ground. From this the trunk rapidly narrowing rises to the height of 25 feet. On the South side, from top to bottom, it presents a dead decaying surface, with a narrow opening into its hollow centre. A short sturdy arm projects to the West, and gives the tree from this side a weird uncanny look. On the North side there is still considerable life remaining, and amidst the dead boughs much living spray remains. At the foot of the tree elder bushes are growing.

THE CLIFFORD PRIORY OAK.—On the road side by the Priory Farm at Clifford, stands this old oak, which at 5 feet from the ground gives the good measurement of 25ft. 4in. It is now a hollow trunk some 10ft. high, and split to the ground on the north side. It has, however, still four main branches which are more or less luxuriant and reach a considerable height. It loses much of its dignity in consequence of its standing on a patch of waste ground by the road side, and being hemmed in a good deal. A striking and interesting water-colour picture of it was made by the late T. Lindsay, Esq., of Dulas Cottage, Cusop.

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THE SWANSTON COURT WEEPING ASH.—This very handsome tree grows near the house as Swanston Court, in the parish of Dilwyn. It is a tall tree with wide-spreading branches. It hangs gracefully over the pool

"And dips
Its pendant boughs stooping as if to drink."

One or two large branches have been broken off, but it is yet a symmetrical luxuriant tree. The circumference of the bole is 15ft. 5in. at 5ft. from the ground. It is hollow in the centre, and was accidentally set on fire a few years since in the attempt to smoke out a colony of bees that had taken possession of it. Mr. Evans and his men, with the aid of the water beneath it, were fortunately enabled to save the tree.

THE HOLM LACEY WELLINGTONIA.—The *Sequoia Wellingtonia* in Holm Lacey Park is the finest tree in the county, and since its age is so well known and its growth has been so carefully watched, it is well to put it on record. It was planted in November, 1855, when it was 8 inches high. In 1866 it was 18 feet high; at 1 foot from the ground the circumference of the bole was 3ft. 1in., and at 5 feet, 1ft. 8in. At the present time, 1871, the tree is 16 years old, and 27 feet high. It girths at 1 foot from the ground 5ft. 3in., and at 5 feet from the ground it is 3ft. 6in. in circumference. Its rate of growth, therefore, is about 1ft. 9in. a-year.

THE NEWBURY OAK.—At Newbury, in the parish of Grendon Bishop are the remains of a very magnificent Oak (*P. pedunculata*). It is but the charred shell of a tree, yet it still lives, and enough remains of it to show its former grandeur. A fire was lighted some few years since to drive out a swarm of bees and thus the tree itself was burnt to its present state. One third of the bole has been destroyed, the remaining two-thirds measure 22 ft. 1 in., and since it is still very upright and free from excrescence, when perfect, its circumference could not have been less than 31ft. or 32ft. in fair measurement.

MOCCAS PARK.

"Hail! stately Oaks, whose wrinkled trunks hath stood,
Age after age, the sovereigns of the wood."

The discovery of a new Mistletoe-Oak by the Rev. Sir George H. Cornewall, Bart., on the Moccas Estate, had an irresistible claim on the immediate attention of your Commissioner. "Ever prompt where duty calls," he rushed from inditing "Notes" of single trees, scattered here and there in the county, to find himself surrounded by an *embarras de richesses* in a single locality. To give the

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brief report of this hurried visit, which the limited space remaining at his disposal demands, and to do justice at the same time to the series of magnificent trees that luxuriate in Moccas Park is simply impossible; and there seems nothing for it but to give the facts as they were met with, and to offer a humble apology to "the Spirit of every tree"—and there will be very many of them—that does not get the full description it merits.

The chief approach to Moccas now leads through a part of that grand avenue of Scotch Firs, and Yew trees, which bears the name of MONNINGTON WALK. It presents a very striking feature of the Estate, and, indeed, of this district of the county. The Walk extends in a direct line west from Monnington Court to Brobury. It occupies the high ground on the northern side of the river. It is very level, well turfed, and nearly a mile long. The views from it are very fine and the trees themselves very picturesque. The Scotch Firs may be said to average from 8ft. to 9ft. in circumference at 8 feet from the ground. Here are the actual measurements of 20 of them: 7ft. 11in.; 8ft. 3in; 8ft. 3in., a beautiful tree in front of the vicarage; 8ft. 1½in.; 8ft. 3½in.; 8ft. 5in.; 7ft. 9½in.; 9ft. 9in., damaged by wind and decay; 9ft. 8in.; 9ft. 3in.; 9ft. 9in.; 9ft. 8in.; 9ft. 7in.; 10ft. 7in.; 10ft. 11in.; 8ft. 5in.; 8ft. 11½in.; 9ft. 1½in.; and 10ft. 5½in. The Yew trees at 4ft. from the ground average about 5ft. 10in.—the two largest measuring 7ft. 3in., and 7ft. 6in. in circumference. Here and there Oaks have been planted in place of the Firs, but this lapse of good taste is being extinguished and the Fir trees restored according as the Oaks are removed, or as accidents to tree life may require.

The Walk is continued in the same line through Monnington Coppice of Oakwood, by Oak trees of a much later date; but over Brobury Scar the avenue is formed of Sweet Chestnut trees of a size and character that carry the mind back again to the original formation of the Walk. Here are the measurements of half a dozen of the best Sweet Chestnut trees:—14 ft. 7½ in.; 13 ft.; 14 ft. 4 in.; 14 ft. 3 in.; 15 ft.; and 12 ft. 11 in. in circumference. They reach the height of some 50 or 60 ft., but are considerably past their prime.

Monnington Walk has long been an object of great interest in itself, but history is silent as to the exact time and cause of its formation. There can be no doubt, however, that this extensive piece of ornamental planting was made as an approach to Monnington Court, from the Welsh borders by Bredwardine ford (before the bridge was built)—and by inference its formation may be dated at about the middle of the 17th century. One of the trees in the Walk was blown down about three years ago, and on carefully examining it the annual rings of growth in the wood were found to be 240—this would show the date to be 1628. About this time Monnington Court was the seat of the Tomkyns' family—Sir John Tomkyns, Knt., lived there. His son Uvedale Tomkyns is believed to have built Monnington Church, for his initials are to be seen on the Church Porch, Font, and Communion Table, coupled with those of his wife, Mary, daughter of Edward Capel, of How Caple (presumably an heiress); and the

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architecture of the Church moreover corresponds with the period. Uvedale Tomkyns died in 1692 at the age of 43. From the Tomkyns' family Monnington Court passed into the possession of the Capels; thence to the Whitmores, by the marriage of John Whitmore with Mary Capel (ob. 1720); and by the Whitmores the estate was sold to Sir George Cornewall, the grandfather of the present Baronet.

Two centuries earlier, tradition has it, that Owen Glendower and his two daughters lived in hiding at Monnington Court. He is said to have died there (1416), and being a wizard, to have been buried under the walls of the original church, half in and half out—his head and shoulders inside, and his body and legs outside. This story must be left and the road to Moccas taken over the new bridge built by the late Sir Velters Cornewall, Bart, in 1868.

Now for a series of hard facts, which those who are not tree lovers had better skim over. Tape in hand let us set out from the Court. Yes! that Evergreen Oak to the right is a fine tree. At 1 foot from the ground it measures 11ft. 6in., and then separates into two pretty equal divisions 6ft. 6in. and 6ft. 10in. at 5ft. from the ground: the left hand tree with a fine single bole measures 8ft. 10in. There are many others down the drive of smaller size, all of them showing the effects of the severe winter. There are some trees of *Q. ilex* too planted round the old Norman church with its nave, and chancel, and circular apse now in course of restoration; but interesting as this church is, it must be passed by, and so too must the many fine growing Oaks in the Lesser Park, which measure say from 12 to 14 feet in circumference. Many of them are very fine single or clustered, and growing yearly into trees of mark.

The Young Avenue of Oaks planted by Sir Gilbert Lewis in the year 1841 deserves a little attention. The young trees are growing freely and well. Half-a-dozen of the best of them on the North side gave these measurements: 3ft. 6in.; 3ft. 11in.; 4ft. 3in.; 4ft. 4in.; 3ft. 8in.; and 3ft. 7in.; and a similar number on the South side, these: 4ft.; 3ft. 7in.; 3ft. 5in.; 3ft. 6in.; 3ft. 6in.; and 3ft. 1in. As the Third Earl of Carlisle wrote on a pillar near some trees he planted at Castle Howard, in 1731:

> "If to perfection these plantations rise,
> If they agreeably my heirs surprise,
> This faithful record will their age declare,
> As long as time these characters shall spare."

A charming bit of wilderness succeeds the Avenue, where massive Oaks—a dead one here and there—are surrounded by a loosely scattered undergrowth of thorn trees, sloes, eglantine, and briars. Pass through it and the grand trees of the Park itself come into view—that is to say, they will do so as soon as the commonplace hedgerow timber, and the hedges themselves which border the road here are removed, and it was pleasant to hear that their fate was sealed.

Once in the Park and he who would note the size of remarkable trees must set to work in earnest. The two scraggy Oaks to the right, each a picture in itself, measure 15ft 9in. and 17ft. 4in.; then, taking the North side of the pool,

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the tree at the water's edge with its split and gaping trunk has a girth, false though it be, of 30ft. 9in. The next is swelled by excrescences to 20ft.; then come two more 13ft. 10in. each. A double tree at 3ft. from the ground measured 19ft. 6in.; then another at hand, 14ft. 1in., and next a burlesque of a tree that wrapped its dark extraneous growth round itself like a frieze mantle, measured 26ft. 10in. in circumference.

From the west end of the valley the landscape is singularly interesting and picturesque. The open valley, itself of considerable length, is formed by the grass tufts which fill the shallow pool. Oaks in numbers, gnarled and knotted, mark the margin of dry ground in irregular order. Here is a slight promontory of bright grass on which the trees advance, and there a bay of dusky green from which they recede. A small bed of Alder trees comes in well at the far end, and looking along the green vistas on every side up the Park, many of those massive trees of natural growth come in, and add their grandeur to the picturesque character of their lower neighbours. Throw into this scene the varied effects of light and shade; a herd of deer coming to drink at the pool; the noise of the jackdaws that haunt the hollow trees; the cries of wild fowl, and their occasional appearance; and you have a picture to enchant an artist. If he is a tree artist he will certainly put the two picturesque old Oaks near the water's edge into the foreground. The largest has a trunk some 30ft. high, which measures no less than 28ft. 4in. in girth. Its roots crawl along the ground.

> "A quarry of stout spurs and knotted fangs,
> Which, crook'd into a thousand whimsies, clasp
> The stubborn soil and hold it still erect."—*Cowper.*

Its fellow tree measures 22ft. in circumference. A Birch tree, in full luxuriance, gives the very unusual measure of 10ft. 1in.; and another afterwards met with measured 9ft. 2in. At this size and age the bark becomes singularly rough, and the smooth white surface it usually shows is only to be found on the smaller branches. Very near, a noble Oak, by the drive, measured 15ft. 8in. Crossing the drive, the KNOLL OAK, standing on the rising ground, is a very lofty, graceful tree in fine luxuriance. It looks larger than it is, for the tape only made it 14ft. 7in. in circumference.

THE CLUB OAK stands some fifty yards further back. It is a tree in full luxuriance, with an upright bole rising some 40ft. into the tree. Its bark is curiously twisted, and with its great size gives it a solid knotty effect. It measures 19ft. 5in. in girth, and rises to the height of 94ft.

> "The body big and mightily pight,
> Thoroughly rooted and of wond'rous height."—*Spencer.*

Your Commissioner was kindly allowed to give this tree the name of "The Club Oak" in honour of the Woolhope Club, of which its owner, Sir George H. Cornewall, Bart., has been the Honorary Secretary for many years. The photograph is taken from the west, which is the only side well open for the purpose, and gives a good representation of the tree.

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REMARKABLE TREES

OF

HEREFORDSHIRE.

THE CLUB OAK.

MOCCAS PARK—MARCH, 1871.

(Quercus sessiliflora.)

This fine Oak is named in honour of the "Woolhope Naturalists' Field Club," of which its owner, the Rev. Sir G. H. Cornewall, Bart., is the Hon. Secretary. It stands on the shoulder of the hill in Moccas Park, and is now in full luxuriance. It has a fine bole, rising some 45 feet into the tree. The bark is curiously twisted, and with its great size, gives it a solid knotty effect. At five feet from the ground, where the card of the Club is placed (itself one foot by six inches), it measures 19ft. 5in. in circumference, and the tree rises to the height of 94 feet.

(Ladmore and Son, Photographers to the Woolhope Naturalists' Field Club.)

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REMARKABLE TREES

OF

HEREFORDSHIRE.

THE TALL OAK.

MOCCAS PARK—MARCH, 1871.

(Quercus sessiliflora.)

This beautiful tree stands on the rising ground of Moccas Park, The Rev. Sir Geo. H. Cornewall, Bart. It is clear in stem, graceful in growth, and attains a very unusual height. Its circumference at five feet from the ground, where the card of the Club is placed (itself one foot by six inches), is 18ft. 7in.; its height 118ft.; and the diameter of its foliage spread is 110ft. The bough at the foot gives evidence of a violent storm.

(Ladmore and Son, Photographers to the Woolhope Naturalists' Field Club.)

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The next Oak measured was one with a slightly damaged centre 15ft. 2in. in girth, and another 17ft. 2in., which seems to have been scarred down the side by lightening. Coming back by the drive were Oaks giving these figures:—13ft. 9in.; 16ft.; 18ft. 8in., with two of its boughs forming a junction with each other; a double Oak 14ft. 1in. and 12ft.; 18ft.; 13.2; 20ft.; 13.2 at 4ft.; 12.2; 17.7, with a hollow open side; 17ft.; 14.8; which arrives at the tree next to the Bredwardine Lodge entrance, which measures 20ft. 10in., and sends its roots above ground on every side very curiously.

Turning up the Park from the lodge the Oaks gave these measurements—20ft. 4in. with excrescences; 13ft. 6in.; 18ft. 5in., getting hollow but very luxuriant; 18ft. 6in., with a fine crop of *Dædalia quercina* upon its bole; 15ft. 8in.; 13ft. 8in.; then a splendid tree in the Park corner 17ft. 11in., of a graceful striking character, its diametric foliage spread was 110ft., and its height was not much less.

Up the dingle here a Wych Elm measured 15ft. 4in. (the one at the lodge gate measured 12ft. 6in.) An Oak with excrescences next measured 19ft. 10in. in girth; a Lime tree 14ft. 10in.; and the "Spring Oak" (from beneath which tree a spring issues forth) measured 16ft. 7in.

THE TALL OAK was then reached, and a magnificent tree it is, clear in stem, graceful in growth, and attaining a very unusual height. One bough has been broken from it, and lies beneath at its foot. Its girth is 18ft. 7in., its height 118ft., and its foliage spread 110ft. in diameter. A more beautiful tree is rarely to be met with. It well bears out Ovid's comment on the Oak:

> "Stabat in his ingens annoso robore quercus
> Una nemus."
>
> In aged majesty a mighty oak
> Towers o'er the subject trees, itself a grove.

The tape then went round a series of Oaks, with these results: 13ft. 4in.; slightly hollow; 16ft. 10in.; 15ft. 11in.; 15ft. 6in.; 14ft. 4in., twisted in growth; 16ft. 9in.; 18ft. 7in.; 15ft. 5in.; 16ft. 10in.; 17ft. 2in.; a wreck, 15ft. 11in.; and another 17ft. 3in. in circumference.

THE MOCCAS OAK, so well known, and so often described and figured, was next visited. Strutt, in the "Sylva Britannica," gives a good engraving of it, and says "The Moccas Park Oak is thirty-six feet in circumference at three feet from the ground. It stands in the park of Moccas Court, the seat of Sir George Amyand Cornewall, Bart., who times his ancestry from Richard, second son of King John, Earl of Cornewall, and King of the Romans. The whole estate from the very nature of its situation, forming part of the borders between England and Wales, is fraught with historical associations, which extend themselves, with pleasing interest, to this ancient 'Monarch of the Wood,' among whose boughs the war cry has often reveberated in former ages, and who has witnessed many a fierce contention, under our Henries and our Edwards, hand

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to hand, and foot to foot, for the domains on which he still survives in venerable though deceasing majesty, surrounded by ancient denizens of the forest, the oldest of whom, nevertheless, compared with himself, seems but of yesterday." (P. 26). And he then quotes some lines which finish thus :

> ——————— Time hollow'd in its trunk
> A tomb for centuries : and buried there
> The epochs of the rise and fall of States,
> The fading generations of the world,
> The memory of man.

Since Strutt's drawing was taken, decay has made progress in lessening the amount of foliage still borne by the tree. It has, however, much living spray remaining, and from the sound state of the northern side of the tree will long continue to bear it. It measured at 5 feet from the ground 36 feet in circumference.

The Old Oak is now well protected by other trees. There are several wide-spreading Beech trees, which must greatly enrich the autumnal prospect; but they only give the following figures :—11ft. 9in. ; 10ft. 10in. ; 10ft. 11in. ; and 11ft. 6in. in circumference.

The great arboreal feature of the eastern end of the Park however consists in the number and size of the Ash trees to be found there. They are so grand, so graceful, and so picturesque as to call to mind Virgil's commendation of this tree—

"Fraxinus in Sylvis pulcherrima."

Nothing approaching them is to be found in this county, whether for size or picturesque beauty so far as your Commissioner is aware. They gave these measurements, 12ft. 4in., 13ft. 6in., 12ft. a tree with two large bunches of Mistletoe on it ; 15ft. 8in., 12ft. 4in. In other parts of the Park, 17ft. 6in. on the hill ; 12ft. 8in. ; 14ft. 3in. ; 11ft. 5in. ; 14ft. a hollow trunk ; and 13ft. 5in. ; whilst in the shrubbery, close to Moccas Court, a grand old stump was prostrate that measured 9 feet only half way round the upper end of the short bole.

The Weeping Oak is a very well known tree. Loudon gives a small figure of it and says (vol. iii., p. 1732), "The largest tree of this variety in England stands in the Park at Moccas Court, Herefordshire, and is perhaps one of the most extraordinary trees of the oak kind in existence. The tree is in vigorous health. The height of the trunk to the first branch is 18ft. ; girt at 9ft. from the ground, 13ft. 2in. ; total height of the trunk, 75ft., with branches reaching from the middle of its height to within 7ft. of the ground, and hanging down like cords. Many of these branches are 30ft. long, and no thicker in any part of that length than a common waggon rope. The entire head of the tree covers a space of 100ft. in diameter. The tree bears acorns every year, from which many plants have been raised, all of which partake more or less of the weeping character of the parent, and many so much so that when they are young they are obliged to be supported by props !"

This tree now measures in circumference 14ft. 3in. at 5ft. from the ground,

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but though several of its branches bear out well the description given of their weeping character, the upper branches now take so much of the ordinary type of the oak as to cause some little disappointment.

Some other Oaks came next near the drive, 13ft. 4in., 12ft. 4in.; 12ft. 9in.; until at the eastern end of the pond the Oaks took on again their gnarled form, and measured 20ft.; 14ft. 2in.; 15ft. 3in.; and 15ft. 11in. Continuing by the drive the next figures are 17ft. 7in.; 13ft. 9in.; and the Golden Bough Oak 16ft. 11in. This oak was so named from the fact of one of its boughs presenting yellow foliage every spring, but it has, however, ceased for some years to do so. The next trees girthed 17ft. 9in.; 15ft. 10in.; 16ft. 7in.; hollow; then two by the ditch 14ft. and 16ft., and two others near the end of the drive, 16ft. 5in. and 17ft. 7in.

THE MISTLETOE OAK on the Moccas Estate is situated in the parish of Bredwardine, about half-a-mile west of the Park. It was discovered a few weeks ago by Sir George H. Cornewall, Bart., when engaged with his steward in marking trees for felling. It grows in the hedgerow of a field called the "Lower House Meadow." It is a thoroughly mistletoe-possessed tree, for the mistletoe was observed to be growing in fifteen different places, five of them near the central axis of the tree; but the tree nevertheless is in a very vigorous state, and does not seem to be injuriously affected by the parasite. The circumference of the bole at 5ft. was 11ft. 6in., the height of the tree 78ft., and the diameter of its spread of foliage 80ft. The largest bunches of mistletoe are on the lowest branch of the tree on the eastern side, as is well seen in photograph. The variety of the Oak is *Quercus pedunculata*, and of the Mistletoe *Viscum album fœmineum*. This tree makes the tenth known example of a Mistletoe-bearing Oak, and it is a far larger and finer tree than either of the three others in this county.

The question of the age of this tree was discussed whilst the photographer was carrying on his preparatory manipulations. The Rev. R. Blight, who was present, had made some observations on the growth of young Oak, and had found that the results did not differ much from those given by De Candolle in his table. He thought the age of Oak trees could be calculated roughly by allowing five years for every inch of the radius of trees that did not exceed 3 feet in diameter, and six years for every inch of trees not exceeding 4ft. 6in. For example, take this Mistletoe-oak. Its girth is 11ft. 6in., divided by 3ft. 1·7th, gives the diameter 43·9in., which may be called, for simplicity, 44in.; the half of this diameter gives the radius 22in., which multiplied by 6 gives the age of the tree as 132 years.

Sir George Cornewall thought this allowance too liberal: he had counted the rings of trees nearly as large as this and made them under 100. Dr. Bull thought the present fallage would give a good opportunity for further observations; and your Commissioner would have agreed with him, but the photographer called out "attention!" and the picture was taken. It is as well to say that the leaning tree in the picture, to the left of the Mistletoe Oak, had "No. 127"

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marked on the other side of it, so that, too, will be a case for observation as its turn comes to be felled.

Many old Pollard Oaks of great size were reported to exist in the Wye-side meadows, near Moccas, which would be grand objects of interest at a further distance from the Park. Here is one of them which your Commissioner afterwards came upon and forthwith named

THE MONNINGTON OAK.—This fine relic of antiquity is situated at the far end of the meadow at Monnington, through which the road passes, near the new stone bridge over the Wye to Moccas. It is a very remarkable tree, a worthy contemporary of the Moccas Oak itself, and like it in size, in character, and in misfortune, too; for a portion on the south side of the trunk is dead, though in this tree it has not separated itself, and thus the bole is still perfect. In both trees the north and western sides are still alive. In tree, as in human life, the sunshine of prosperity is more fatal than the storms and rough usage of adversity. The trunk of the Monnington Oak stands up well, and measures 31ft. in circumference at 5ft. from the ground. At about 18ft. high it separates into two large trunks, both of which are dead. One is broken off close to the division, but the other lifts up its shivered remains some twenty feet through the spray of small foliage that still shoots out around it; and with some dead boughs lower down, makes it highly picturesque. Well may it be said of this tree with Spencer:

> "His bared boughs were beaten with storms,
> His top was bald and wasted with worms,
> His honour decay'd, his branches sere."

In returning from Moccas Park to the Court the way may be taken by the old Yew tree—a contemporary, it may be, of the old Moccas Oak, for it gives the very considerable circumference of 22ft. 9in., and has a very stationary air about it, as if it had grown at the lowest possible rate. Well might it be asked

> "What scenes have pass'd since first this ancient Yew
> In all the strength of youthful beauty grew?"

And the answer would be difficult to give. Crossing an arable field a surprise is created by the appearance of a hanging bank of Box trees on the river side, growing luxuriantly—a sight unique for Herefordshire, and a very pleasant one. Where can they get the lime from? is the question that rises involuntarily—and a little examination shows numerous springs trickling down the bank, depositing large masses of *travertine* at their exit from the gravel. They are all petrifying springs, so to speak, and doubtless come from the Cornstone of the hill. They deposit now, as for ages they have done, *travertine*. The walls of the old Norman Church were built with it, and in its restoration cartloads of *travertine* have again been used for the same purpose. This bank, with its hanging wood of Box, is commonly called "Dipple," a supposed contraction of "Deep well." If it may be consistent with the strict principles of the erudite science of Philology to suppose that an "r" also has

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been lost, and that "Dipple" means "Dripple," it would be much more satisfactory to simple people; for the term "Dripwell" is at once highly descriptive and characteristic of the place itself. However this may be, the place must surely be rich in Lichens and Scale-mosses.

Leaving this cheerful bank—let us cross the Warren—where are some Sweet Chesnut trees of good growth, rising to a height of some 80 feet, though as yet only girthing 10.7; 11.9; 11.4., &c.; and there are Beech trees here too, though only 12.6; 10.6.; 12.1, &c., in circumference.

Taking a passing look at some wonderful holly trees,—55ft. high one was estimated—the terraces in the garden of the Court are reached. On their sloping sides grow a varied series of Yew trees, perhaps the most beautiful, as certainly they form the most abiding, feature of the place. They are seen to the utmost advantage by being partly looked down upon. They form an admirable base to the beautiful reach of the river that sweeps by Moccas Court. The long line of Firs on the Monnington Walk crowns the high ground beyond, and with that other most striking feature of the landscape there, the rich, red, beautiful Brobury Scar, will ever linger on the memory of the visitors at Moccas.

Two other trees must complete our catalogue, and they are the two fine Cedars on the lawn. One has the circumference of 13ft. 7in., with a magnificent foliage spread, but it quickly divides into numerous branches—which the wind of last October has terribly shattered. It is the old tale, *divide et impera*. The other next the house,

"The Cedar proud and tall,"

measures only 7 feet 11 inches in girth, but it carries up its central axis to the height of about 70 feet, and forms a most beautiful object from the House. These trees, like those of Hampton Court, Harewood, Shobdon, Tibberton, &c., were planted, in all probability, between the years 1780 and 1790.

Moccas Park in its general aspect is far too much crowded with trees. Every one of the grand old Oaks is surrounded by a grove of smaller ones, until the Park itself is like a wood, and squirrels may skip from end to end without the need of touching the ground. So large a space could scarcely be made to look smaller, for when the leaves are out, tree meets tree, and the eye is restricted everywhere. The explanation of it is this: some half century ago, or rather more, when the sad memory of a heavy timber fallage was green, there was a far-sighted steward at Moccas, of highly prudential "proclivities"—probably a Scotchman—who got permission to plant all these young Oaks to take the place of the old ones as they decayed. When first planted they would look very thinly scattered over the ground, but he—good calculating soul—had measured their distance from each other to a nicety, and knew they could not be put more thickly. Peace to his manes!—he has made right pleasant work in these days for the landscape gardener, and profitable too.

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The way to see well the extent and beauty of Moccas Park is from the back of a steady pony. You can then judge of the great space taken up by the shoulder of the hill; can see how by tree-removal a broad band of light might be let in here and there behind it, so as to throw out the foreground and throw back the hill—

"A gleam
Stretched o'er the tufted surface of the woods
Deepens the blackness of contiguous shade."

This being done, the trees in front might be judiciously removed to suit it; now this dingle might be opened out; that bit of the hill bared; and as one thing always leads on to another in the exercise of taste, the pleasure of gradual improvement may long afford a delightful occupation.

It is said that, many years since, on the south side of the Park, £20,000 worth of timber was felled at one time to meet some unusual expenditure. It is just possible it may have been the effect of that terrible tree destroyer the *Æstus politicus*, which your Commissioner has already shewn to be more fatal to tree life than the *Cossus ligniperda*, *Zeuzera æsculi*, *Sinodendron cylindricum*, *Dorcus parallelopipedus*, and all the rest of the hard-named insects put together. However this may be, the blank left was so terrible a grief to the owner of that day that he resolved it should never happen again to the same extent, so far as he could prevent it, and he therefore, instead of Oaks, planted trees of all kinds, which our friend the timber dealer, with his chracteristic want of politeness, might designate "rubbish." Not so by any means a visitor of sentiment, who, with Cowper, would think

"No tree in all the grove but has its charms
And each its charm peculiar."

And as he wound up the hill beneath the varied trees he would admire them all in turn, though he would long, ever and anon, for some break in the forest of trees, to admit the distant landscape, always so charming there when a peep can be got of it. It is due again to that prudent steward; but the remedy is easy, and with a judicious exercise of taste it may soon be said,

"Here, waving groves a chequered scene display,
And part admit and part exclude the day;
Here, interspersed, in lawns and open glades,
Thin trees arise, that shun each others shades."

As the top of the hill is reached, however, the view becomes more fine, the air more pure, the ride more enjoyable than there is time to tell—for the check-string of the printer has long been pulled in vain.—Neither Merbage Point nor Arthur's Stone may be visited, nor yet a word said of the varied scenery around, albeit it offers the very perfection of Herefordshire scenery.

On the very top of this hill, however, is a very respectable Oak some 9 or 10 feet in circumference, which must be noticed. It is visible in full size from the Court, and was a great favourite with Lady Cornewall. "I would not lose that oak," she said one day, "for a hundred pounds," and it has

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ever after borne the name of the "Hundred pound Oak." The wonder is that in so high a situation it should be able to find the good soil necessary to produce it.

Moccas Park lies on the north side of Bredwardine hill, and is evidently excellently adapted for growing oak timber. The trees on the rising ground are very different from those growing completely in the valley. Here the grand old Oaks rise out from the turf without the slightest appearance of root on the surface, they send up their massive trunks free from excrescence to a great height, and throw out their noble branches widely on every side. They grow with an apparent ease and freedom that guarantees great depth of soil beneath, and suggests the fine description of the Oak by the old Latin poet:—

——— quæ quantum vertice ad auras
Ætherias, tantum radice in Tartara tendit.
Ergo non hyemes illam non flabra, neque imbres
Convellunt: immota manent, multosque nepotes
Multa virum volvens durando sæcula vincit
Tum fortes latæ ramos et brachia tendens
Huc illuc, media ipsa ingentem sustinet umbram.
Virgil, Geo. II., 291.

——— Whose roots descend
As low towards Pluto's realms, as high in air
Its massive branches rise. The utmost rage
Of wintry storms howls o'er its strength in vain.
Successive generations of mankind,
Revolving ages flourish and decay,
Yet still immoveable it stands and throws
Its vigorous limbs around and proudly bears
With firm and solid trunk its stately form,
A mighty canopy of thickest shade.

If you would judge how well Oaks can grow in Herefordshire soil; if you would see the grandeur of this noble tree in its fullest luxuriance; if you would admire the variety of picturesque forms it can assume in the later periods of its life; visit Moccas Park. There you will not only find them in great abundance, but you will find also a richness of landscape that becomes them, and cannot fail to carry away impressions that will be lifelong in the pleasure their memory will recall. Of all such enjoyments of Nature and Nature's works—unlike the more exciting pleasures of social life,—it may ever be said

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WOOLHOPE NATURALISTS' FIELD CLUB.

STATEMENT OF ACCOUNTS for the YEAR ENDING DECEMBER 31st, 1870.

Dr.	£	s.	d.
To Subscriptions received for 1870	54	0	0
,, Entrances received from nine new Members... ...	4	10	0
,, Arrears of Subscriptions received for 1869	23	0	0
,, Arrears of Subscriptions received for 1868	1	0	0
,, Arrears of Entrances received for 1869	2	0	0
,, Cash received for spare copies of Transactions ...	2	2	0
,, Cash received for Illustrations	1	1	0
,, Cash from Savings Bank...	35	0	0
,, Received from James Rankin, Esq. in payment for the Clavis Agaricinorum	9	10	0
,, Balance due to Treasurer	2	6	7
	£134	9	7

Cr.	£	s.	d.
By Balance due to Treasurer December 31, 1869 ...	27	9	6
,, Reports of Copies of Meetings, &c. ("Hereford Times")	29	2	6
,, Reports of Field Meetings, &c., 1870 ("Hereford Times")...	17	14	6
,, Binding 254 Vols. of Transactions and Carriage ...	13	1	8
,, Circulars, Mounts, Stationery, Stamps, &c.	18	12	6
,, Ladmore and Son (Photographs)	5	8	8
,, E Palmer and Son (Lithographs)	8	10	3
,, Assistant Secretary for 1869	5	0	0
,, Printing and Colouring 250 Copies of the Clavis Agaricinorum	9	10	0
	£134	9	7

Examined and found correct.

HENRY G. BULL, M.D.,
THOMAS CAM, } Auditors.

HENRY COOPER KEY, President.
ARTHUR THOMPSON, Treasurer.

Hereford, February 21st, 1871.

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OFFICERS FOR THE YEAR 1871.

President:

THOMAS CAM, Esq., F.R.C.S.E., Hereford.

Vice-Presidents:

EDWIN J. ISBELL, Esq., Hereford.
EVAN PATESHALL, Esq., Allensmoor Court, Hereford.
The Rev. THOS. PHILLIPPS, M.A., Dewsall Rectory, Hereford.
The Rev. H. W. PHILLOTT, M.A., Staunton-on-Wye, Hereford.

Central Committee of Management:

T. CURLEY, Esq., C.E., F.G.S., Hereford.
JOHN LLOYD, Esq., Huntington Court, Hereford.
C. G. MARTIN, Esq., Hereford.

Honorary Secretary:

The Rev. Sir GEORGE H. CORNEWALL, M.A., Bart., Moccas Court, Hereford.

Treasurer and Assistant Secretary:

Mr. ARTHUR THOMPSON, St. Nicholas Street, Hereford.

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FIELD MEETINGS APPOINTED

1871.

1—FRIDAY, MAY 26TH.....Hay, for Cusop Dingle.

2—TUESDAY, JUNE 20TH (Ladies' Day).....The Aberedw Rocks.

3—THURSDAY, JULY 20TH.....The Carmarthen Vans.

4—TUESDAY, AUGUST 29TH.....Ross, for Forest of Dean.

5—TUESDAY, OCTOBER 10TH.....Hereford, for the Fungus Foray.

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